REPORT

OF THE

Indian Tariff Board

ON THE

GRANT OF PROTECTION TO THE PAPER AND PAPER PULP INDUSTRIES

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PRELIMINARY.

Terms of Reference.

The protective duties imposed on certain kinds of paper by the Bamboo Paper Industry (Protection) Act of 1925, expire on the 31st March, 1932, and the Government of India in Commerce Department Resolution No. 202-T (26), dated the 26th March, 1931 have referred to the Tariff Board the questions how far these duties have achieved their object and what measure of protection, if any, should be continued after the 31st March, 1932. The terms of the Government of India Resolution are as follows:—

> " Under the Bamboo Paper Industry (Protection) Act, 1925, protective duties were imposed on certain kinds of paper in order to develop the manufacture in India of paper from Bamboo. These duties will expire on the 31st March, 1932, and before that date it is necessary that an enquiry should be held in order to ascertain how far the Act has achieved its purpose and whether the continuance of protective measures beyond that date is desirable. The Tariff Board is therefore requested to examine the question and to consider what protective measures (if any) should be continued after the 31st March, 1932. In making its recommendations the Tariff Board will take all relevant considerations into account including that stated in part (*b*) of the Resolution adopted by the Legislative Assembly on the 16th February, 1923.
>
> 2. Firms or persons interested in the paper-making industry or in industries dependent on the use of paper who desire that their views should be considered by the Tariff Board should address their representations to the Secretary to the Board.
>
> 3. The Government of India hope that the Tariff Board will be able to submit their Report by the 15th October, 1931."

The Board's Enquiry.

2. The Board issued a Press Communique on March 30th, 1931, calling upon all firms and persons interested to submit written representations not later than May 1st. Statements were received from all the leading Paper Mills in India as well as from Chambers of Commerce, the Paper Import and Traders' Associations and various individuals interested in the trade. The Board issued two questionnaires, one for manufacturers and one for importers and traders, and called for replies by the 20th June. We started on tour on July 12th and the actual programme of our enquiry was as follows:—

July 14th.—Inspected Andhra Paper Mills, Rajahmundry.

July 16th.—Arrived Calcutta.

July 20th.—Inspected Titaghur and Kankinara Mills.

July 21st.—Inspected Naihati Mill.

July 23rd.—Inspected Raniganj Mill.

July 25th.—Inspected Upper India Couper Paper Mills, Lucknow and took evidence.

July 27th.—Inspected Experimental Plant, Forest Research Institute, Dehra Dun and took evidence.

July 30th.—Arrived Calcutta.

August 1st.—Took evidence of India Paper Pulp Company.

August 2nd.—Took evidence of Titaghur Paper Mills Company.

August 4th.—Took evidence of Bengal Paper Mill Company.

August 5th.—Took evidence of Andhra Paper Mills Company.

August 6th.—Took evidence of Paper Importers and Paper Traders.

August 8th.—Took evidence of Controller of Printing and Stationery.

August 29th.—Inspected Deccan Paper Mills.

August 30th.—Took evidence of Deccan Paper Mills.

September 21st.—Took evidence of Mr. B. Abdy Collins, C.I.E., I.C.S., Director General of Commerce and Industries, His Exalted Highness The Nizam's Government, Hyderabad.

We wish to acknowledge the courtesy and assistance extended to us by the staff and the agents at all the Mills we visited and by Mr. Blascheck, the President of the Forest Research Institute, and his assistants.

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Report on the Grant of Protection to the Paper and Paper Pulp Industries.

CHAPTER I.

The previous Report and the existing Protective Duty.

Paper made from *sabai* grass excluded from the protective scheme.

In its Report of 1925 regarding the grant of protection to the Paper and Paper Pulp Industries the Tariff Board found that the claim to protection depended almost entirely on the possibility of manufacturing paper from bamboo. The Board considered that the mills which used *sabai* grass had no natural advantages in competition with imported paper and that, in so far as the industry was dependent upon the use of that grass, it would never be able to dispense with protection save in one locality where conditions were especially favourable. The main factor which led the Board to this conclusion was the high cost of the raw material, due partly to internal competition and partly to the great distances over which it was necessary to transport it. There was a possibility that these difficulties might be overcome by the project, mooted by the Punjab Paper Mills Company, for the erection of a paper mill near Saharanpur in a district where all the 15,000 tons of grass required for a 6,000-ton paper mill could be collected within a radius of 20 miles from the mill and cheap hydro-electric power would be available. But with this single exception the Board held that the mills using grass could not establish a claim for the grant of protection under the conditions laid down by the Fiscal Commission.

The Board's recommendations in 1925.

2. The manufacture of paper from bamboo was admittedly still in an experimental stage though the Board was satisfied as to the possibility of making excellent paper from bamboo pulp. The Board therefore considered it inadvisable for Government to commit themselves finally to protection for the Paper industry, but in order that the work already done one bamboo should not be wasted and that opportunity and encouragement should be afforded for further exploratory work it made two recommendations. It suggested in the first instance that Government should provide financial assistance to the mills which had been, carrying out these experiments and to other mills which might take up the investigation. Secondly, it proposed that for five years, in place of the existing *ad valorem* duty of 15 per cent., a specific duty of one anna a lb. should be imposed on all writing

paper and on all printing paper other than chrome, marble, flint, poster, stereo and newsprint containing 65 per cent. or more of mechanical wood pulp. The Board held that neither of these remedies would suffice without the other.

Direct financial assistance.

3. The Board stressed the fact that fresh capital must be raised by the industry if the possibilities of bamboo were to be fully investigated. It considered that if the assistance given by Government were limited to a period of five years with no guarantee of its continuance thereafter it would be extremely improbable that capital could be raised in the open market. It therefore recommended assistance in the form of an advance or guarantee by Government of the capital required by the firms best equipped to carry out the work which had to be done. In effect the recommendation was for an advance or guarantee of Rs. 10 lakhs to the India Paper Pulp Company's mill at Naihati where the sulphite process was being investigated and, provided satisfactory answers were received to questions regarding the probable cost of bamboo delivered at the mill and the probable cost of power and fuel, for a similar advance or guarantee, limited to Rs. 10 lakhs, to the Carnatic Paper Mills Company's mill at Rajahmundry where the soda process might be tested.

The specific protective duty.

4. Over and above the provision of additional capital the Board found it necessary to secure to the mills an average selling price of about Rs. 560 per ton at the mill for white printing and writing paper. It estimated that with the 15 per cent. *ad valorem* duty the mills ought to realise an average price of about 3½ annas per lb. equivalent to Rs. 490 a ton. In order to raise this price to Rs. 560 a ton, which the mills must realise if they were to meet all charges and provide fully for depreciation, the Board recommended that on all printing and writing papers, with certain specified exceptions, the *ad valorem* duty of 15 per cent. should be converted into a specific duty of Rs. 140 a ton or one anna per lb. The exceptions were either special papers which are not made in India and do not compete with Indian made paper or expensive papers of high quality which the Indian mills cannot manufacture profitably.

Papers exempted from the protective duty.

5. The most important class of paper excepted from the protective scheme was 'Newsprint', a kind of paper containing about 70 per cent. of mechanical wood pulp on which most Indian newspapers are printed. The landed cost of the paper including duty was not more than 2½ annas per lb., about an anna per lb. below the price at which the Indian mills could sell. It was recognised that the Indian mills using Indian materials could not manufacture at a cost which would enable them to compete with imported newsprint. Mechanical pulp had never been made from either grass or bamboo and the existence of a cheap newspaper press depended directly on the use of a paper containing a high proportion of mechanical wood pulp. The Indian mills themselves

eventually abandoned their claim to a protective duty on this class of paper and the Board accordingly recommended that printing paper containing not less than 65 per cent. mechanical wood pulp should be excluded from the scope of the protective duties. Other papers excluded were Stereo, Poster, Chrome, Flint and Marble. Stereo paper is a highly absorbent paper not made by Indian mills and Poster paper requires in its manufacture special plant which none of the Indian mills possessed. Chrome, Flint and Marble papers were excluded on the application of lithographic firms that all ' litho ' papers should be excluded; but as lithographers use many varieties of paper, some of which do not differ greatly from the paper used by printers, it was only possible to exclude those three varieties which have well understood trade names and can be readily identified.

The decision of the Legislature.

6. The Government of India rejected the Board's recommendation for the grant of financial assistance to the mills conducting experiments with bamboo for the following three reasons. Firstly, the India Paper Pulp Company was a private Company; secondly, the sulphite process which was to be tested with the assistance of the subsidy was covered by patent rights held by one of the members of this private Company; and thirdly, financial assistance to an industry should assist equally all competitors within that industry and should not benefit one mill alone and thereby give it an undue advantage over its rivals. In place of the proposal for financial assistance the Government suggested that the period of the protective duties should be extended from five years to seven and computed that the additional two years ought to give the Naihati and Rajahmundry mills approximately the same total sum of money as the subsidy recommended. The Legislature accepted the Government's proposals and passed the Resolution moved by the Commerce Member with one amendment *viz.*, the addition of " Super-calendered paper imported on reels " to the kinds of paper excluded from the protective duties. The Government at once introduced a Bill giving effect to the terms of the original Resolution and the Bill was duly passed in both Houses without amendment in September, 1925. It may be noted that since the Act provides that the protective duties expire on 31st March, 1932, the period of protection provided is only 6½ years. The Government undertook to examine the whole question of " Super-calendered paper " and, if necessary, to introduce an amending Bill to add this class of paper to those excluded from the protective duties. The promised examination was made and it was found that the term " Super-calendered " denoted merely the finish given to any paper and that paper manufacturers in India did in fact produce paper with this finish. It was also reported that most of the presses which used super-calendered paper imported it in sheets and not on reels and that the paper so imported generally satisfied the test laid down for " Newsprint " and was therefore exempt from the protective duty. The Government therefore concluded that, if a protective duty is

leviable on paper by reason of its containing less than 65 per cent. mechanical wood pulp, that duty should be levied whether the paper be super-calendered or not and whether, if super-calendered, it be imported in sheets or on reels. The members of the Commerce Departmental Advisory Committee who were consulted agreed with this view and no amendment of the Act was undertaken.

The Amending Act XX of 1927.

7. In 1926 a question was raised whether the percentage of mechanical wood pulp in printing paper should be calculated on the nett fibre content of the paper or on its total weight. The question was referred to the Tariff Board in 1927 and the Board found that the intention of the Legislature would best be served by requiring the percentage of mechanical wood pulp to be calculated on the nett fibre content. This recommendation was embodied in an amending Act, XX of 1927. This Act also set right two other matters in which the original Act of 1925 had failed to carry out the intentions of the Legislature. The wording of the Schedule attached to the Act of 1925 excluded from the protective duties not only printing paper containing not less than 65 per cent. mechanical wood pulp but also printing paper containing no mechanical wood pulp at all. Since this class of paper competed with paper manufactured in India it was necessary to amend the Schedule in such a way as to make printing paper containing no mechanical wood pulp liable to the protective duty. It had also been noticed that the protective duty of one anna per lb. leviable on all sorts of writing paper was in some cases substantially less than the former *ad valorem* revenue duty of 15 per cent. It was therefore decided to amend the Schedule so as to render liable to a duty of one anna per lb. or 15 per cent. *ad valorem* whichever was higher, " ruled or printed forms (including letter paper with printed headings) and account and manuscript books and the binding thereof ".

The present tariff entries.

8. The sections of the Tariff Schedule which deal with paper now* stand as follows, the *ad valorem* rate of 15 per cent. having been raised to 20 per cent. since March 1st, 1931:—

No.	Name of Article.	Per.	Tariff Values.	Duty.
21	Trade catalogues and advertising circulars imported by packet, book or parcel post.	..	..	Free.
21-A	Postage stamps, whether used or unused .	..	..	Free.
21-B	Paper Money	..	..	Free.

---

*The Schedule quoted exhibits the Customs duties as they stood on September 15th, 1931. Since then a surcharge of 25 per cent. on the existing duties has been proposed by the Government of India. This is still under consideration by the Legislature and therefore throughout this Report all mention of Customs duties refers to the Schedule quoted in this paragraph.

No.	Name of Article.	Per.	Tariff Values.	Duty.
99	Paper and articles made of paper and papier mache, pasteboard, millboard and cardboard of all sorts, and stationery including drawing and copy books, labels, advertising circulars, sheet or card almanacs and calendars, Christmas, Easter, and other cards including cards and booklet forms, including also waste paper and old newspapers for packing, but excluding trade catalogues and advertising circulars imported by packet, book or parcel post and postage stamps whether used or unused and paper money and paper and stationery otherwise specified.	..	*Ad valorem*	20 per cent,
155	Printing paper (excluding chrome, marble, flint, poster and stereo) all sorts which contain no mechanical wood pulp and in which the mechanical wood pulp amounts to less than 65 per cent. of the fibre content.	lb.	..	One anna.
156	Writing Paper—			
	(*a*) Ruled or printed forms (including letter paper with printed headings) and account and manuscript books and the binding thereof.	lb.	..	One anna or 15 per cent. *ad valorem* whichever is higher.
	(*b*) All other sorts	lb.	..	One anna.
	Tariff Values.			
	Old newspapers in bales and bags . .	cwt.	4 9 0	20 per cent.
	Printing paper (excluding chrome, marble, flint, poster and stereo) in which the mechanical wood pulp amounts to not less than 65 per cent. of the fibre content, glazed or unglazed, white or grey.	lb.	0 1 10	20 per cent.
	Packing and Wrapping Paper—			
	Machine glazed pressings . . .	lb.	0 2 0	20 per cent.
	Manilla, machine glazed or unglazed, and sulphite envelope.	lb.	0 2 3	20 per cent.
	Kraft and imitation kraft . . .	lb.	0 2 3	20 per cent.
	Straw boards	cwt.	6 0 0	20 per cent.

CHAPTER II.

The effect of the Protective duty on the Paper Industry in India.

The consumption of paper in India.

9. We propose now to show how the industry in India has progressed under the protective scheme and to make a general review of its present day condition. The following table exhibits the extent to which the consumption of paper has increased in India since the last enquiry and the percentage of the Indian market supplied by the Indian Mills.

TABLE I.

—	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Total quantity of paper imported (including pasteboard)	84,943	87,414	100,419	104,450	115,629	137,018	114,690
Total quantity manufactured by Indian Mills . .	27,020	28,221	31,672	34,678	38,222	38,609	39,587
Total consumption . .	111,963	115,635	132,091	139,128	153,851	175,627	154,277
Percentage of increase in total consumption over 1924-25	...	3·31	17·98	24·26	37·41	56·86	37·79
Percentage of Indian manufactured paper to total consumption . . .	24·13	24·40	23·98	24·92	24·83	21·98	25·66

NOTE.—These figures do not exactly tally with those supplied by the Director General of Commercial Intelligence. We have taken the annual figures supplied us by the mills and it may be noted that those supplied by the Bengal Paper Mill Company and the Upper India Couper Paper Mills Company relate to calendar years.

The next table displays the position with regard to papers assessed at the protective rate of duty only.

TABLE II.

—	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Imported Paper—							
(*a*) Printing Protected .	...	...	7,683	7,651	8,641	8,547	6,818
(*b*) Writing Protected .	...	...	9,143	10,439	10,424	11,546	7,361
Total protected .	20,000	17,000	16,826	18,090	19,065	20,093	14,179
Indian made paper—							
(*a*) Printing . . .	15,140	15,736	16,738	18,101	19,941	19,991	21,009
(*b*) Writing . . .	5,021	5,803	7,238	8,424	9,143	9,341	9,840
(*c*) Badami . . .	3,170	3,150	3,765	3,966	4,515	4,159	4,018
Total .	23,331	24,689	27,741	30,491	33,599	33,491	34,867
Total consumption of protected paper.	43,331	41,689	44,567	48,581	52,664	53,584	49,046
Percentage of Indian made paper to total consumption.	53·84	59·22	62·25	62·76	63·79	62·52	71·09

The Deccan Paper Mills Company have not supplied us with figures showing their annual output classified under the various headings and they are not included in the above table. Their total output in 1924-25 was 877 tons and in 1930-31 was 2,190 tons. From the Company's replies to the questionnaire we find that their realised prices are lower than those of other mills and that in 1930-31 badamis and wrappings represented nearly 75 per cent. of their total output. We therefore think it safe to assume that their output of paper competing with protected classes is relatively small. It will also be noted that we have included all the badami manufactured by the other mills. Some of this will compete with unprotected paper and that amount may reasonably be set off against the protected paper manufactured by the Deccan Paper Mills Company.

It will be seen from these tables that until 1930-31, the figures for which year must largely reflect the world-wide trade depression, the consumption of paper in India has steadily increased and that the Indian mills have generally speaking kept pace with that increase and held their own, the percentage of the market supplied by them remaining fairly constant. The increased percentage for 1930-31, which is due to the big drop in the quantity of imported paper, must be considered an indication of the restricted purchasing power of the country. It will be seen from Table II that the

Indian mills have held the greater part of the market for printing and writing papers. With regard to Table II it should be pointed out that the figures for imported paper for the year 1924-25 and 1925-26 are necessarily estimates since the protective duty was not levied until September, 1925. For the year 1924-25 we have adopted the estimate made by the Board in its previous Report. It might have been possible to take the average proportion of protected to unprotected papers during the years 1926-1931 and apply that proportion to the total imports in 1924-25. But as the result of such a calculation would fail to indicate the decline in the imports of protected papers which must have taken place immediately after the Protection Act was passed, we have thought it better to adopt the round figure of 20,000 tons. Similarly for 1925-26 the only figure supplied in the Trade Returns is the figure of 8,676 tons which represents only six months imports under protection. We have taken the round figure 17,000 tons for the whole year which is probably on the low side. For the purposes of comparison we set out in Table III the total imports of paper into India since 1923-24 under the main headings adopted in the Trade Returns and from the year 1925-26 onwards we distinguish between protected and unprotected classes of paper under these main headings.

TABLE III.

——	1923-24.	1924-25	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Packing paper	4,930	7,035	8,805	10,376	12,312	11,426	14,342	11,568
Newsprint—								
i.—Protected	...	...	37	20	817	471	375	209
ii.—Unprotected	...	...	13,635	20,862	15,194	16,481	23,912	21,331
Total	10,029	17,762	13,672	20,882	16,011	16,952	24,287	21,540
Other Printing—								
i.—Protected	...	...	4,989	7,663	6,834	8,171	8,171	6,608
ii.—Unprotected	...	...	6,356	1,751	4,086	9,463	7,817	6,011
Total	9,884	11,735	11,345	9,414	10,920	17,634	15,988	12,619
Writing and Envelopes—								
i.—Protected	...	...	3,649	9,143	10,439	10,424	11,546	7,361
ii.—Unprotected	...	...	4,133	410	505	527	699	505
Total	8,148	8,305	7,782	9,553	10,944	10,951	12,245	7,866

TABLE III—*contd.*

—	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Old Newspapers .	22,080	25,700	28,268	32,872	35,120	37,452	45,631	41,135
Other kinds .	2,715	1,956	2,381	2,453	2,353	3,738	4,470	3,487
Paper Manufactures	1,145	1,588	1,442	1,258	909	1,187	1,188	1,052
Paste Board, Mill Board, Card Board.	10,590	10,862	13,719	13,611	15,881	16,289	18,867	15,423
Grand Total .	69,521	84,943	87,414	100,419	104,450	115,629	137,018	114,690

The figures indicate the very rapid increase in the consumption of paper in India during the past few years. It will be seen that the increase applies equally to protected and unprotected classes of paper. It is perhaps worth while noting in connection with this table that the main heading "Other kinds" refers almost entirely to special high class papers which have a declared value of anything up to Rs. 1,000 a ton.

The existing mills in India.

10. At the time of the Board's previous enquiry in 1924-25 there were 9 paper mills in India, three having four machines each, one having two and the rest one each. Two new mills were at that time projected, one near Saharanpur in the Punjab and one, which had been partially constructed, at Rajahmundry in Madras. So far as we have been able to ascertain, the position to-day is that three mills (The Titaghur Paper Mills Company's mills at Titaghur and Kankinara and the Bengal Paper Mill Company's mill at Raniganj) still have four machines each, the Upper India Couper Paper Mills at Lucknow still have two machines and the India Paper Pulp Company's mill at Naihati and the Deccan Paper Mills Company's mill at Poona, which then had only one machine each, now have two; of the three other mills—two in Bombay and one at Punalur in Travancore—the Director of Industries, Bombay, has informed us that one of the Bombay mills is at present closed; the other Bombay mill was in 1924 acquired by the Deccan Paper Mills Company who still work it in addition to their mill at Poona; and of the mill at Punalur we have obtained practically no information regarding its capacity or output. Of the two new mills, that at Rajahmundry which was partially constructed in 1924 did not actually start work till April, 1930 and is even now working only spasmodically and on a very small scale. The delay in starting work was largely due to difficulties in securing adequate working capital, and the present very restricted working is due to the same cause. Further, the mill as originally erected was designed for the manufacture of Kraft and similar papers from straw, and as the Company now has an assured supply of bamboo it has been necessary to make extensive alterations in the plant. The Punjab Paper

Mills Company's mill near Saharanpur started work in 1929 and worked altogether for about nine months, when the Company went into liquidation. We have been informed that there is a possibility of litigation with reference to the Company's failure and that we cannot be supplied with detailed facts and figures concerning it, but we understand that the chief difficulty arose from inadequate finance and lack of working capital. Thus, apart from the Travancore mill, the industry is now carried on in eight mills with 20 machines in all.

Firm.	Mill at	Number of paper machines.	Maximum capacity Tons.
Titaghur Paper Mills Company.	Titaghur .	4	20,800
Ditto .	Kankinara .	4	
Bengal Paper Mill Company .	Raniganj .	4	10,200
India Paper Pulp Company .	Naihati .	2	6,000
Upper India Couper Paper Mills Company.	Lucknow .	2	3,600
Deccan Paper Mills Company .	Poona .	2	4,000
Ditto .	Bombay .	1	
Andhra Paper Mills Company .	Rajahmundry .	1	1,000(a)
		20	45,600

(a) The capacity of the mill as at present equipped is said to be 4 tons of paper day. But it is working at present in such a small way that in 1930-31 its total output was only 131 tons.

The Board in 1925 estimated the full capacity of the 16 machines in the five mills of which it took account as 33,000 tons a year. The increased capacity of 12,600 tons a year is due mainly to the installation of additional paper machines at Naihati and Poona and to the starting of a new mill at Rajahmundry. At present the Titaghur Paper Mills Company's two mills and the mills at Raniganj and Naihati are working nearly to their full capacity; the mills at Lucknow and Rajahmundry each make about 1,000 tons less than their capacity and the Deccan Paper Mills Company's output falls short of their capacity by about 2,000 tons.*

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* We have received a letter from the Government of Bengal, dated 29th September, 1931 in which they state that besides the three large paper Companies in Bengal there is also a small mill which manufactures strawboards from waste paper and cardboards. The output is said to be 1,800 tons of strawboard per annum. We have received no representation from this mill and have no further information concerning it.

Indian made paper.

11. Table IV exhibits the outturn in tons of paper of the four principal Companies for each year from 1924-25. We have noted in connection with Table II that detailed figures under the various heads are not available for the Deccan Paper Mills Company. Their output has therefore not been included in the two following Tables:—

TABLE IV.

	Printing.	Writing.	Badami.	Wrapping.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.
1924-25 .	15,140	5,021	3,170	2,548	25,879
1925-26 .	15,736	5,803	3,150	2,323	27,012
1926-27 .	16,738	7,238	3,765	2,318	30,059
1927-28 .	18,101	8,424	3,966	2,438	32,929
1928-29 .	19,941	9,143	4,515	2,655	36,254
1929-30 .	19,991	9,341	4,159	2,574	36,065
1930-31 .	21,009	9,840	4,018	1,924	36,791
Totals .	126,656	54,810	26,743	16,780	224,989

NOTE.—The totals in this Table are less than those in Table I. The difference represents the output of the Deccan Paper Mills Company and certain special classes of paper such as blotting paper, etc.

We show also in the following Table the total amounts of each class of paper produced by each mill during the period under review:—

TABLE V.

Firm.	Printing.	Writing.	Badami.	Wrapping.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.
Titaghur Paper Mills Co.	71,996	33,323	11,629	6,184	123,132
Bengal Paper Mill Co.	33,300	6,617	7,040	9,614	56,571
India Paper Pulp Co..	14,662	12,526	1,307	778	29,273
Upper India Couper Paper Mills Co.	6,698	2,344	6,767	204	16,013
Totals .	126,656	54,810	26,743	16,780	224,989

The Titaghur Paper Mills Company with their two factories at Kankinara and Titaghur remain by far the largest producers of paper in India, making approximately 60 per cent. of all the printing and writing papers made in this country. Printing paper forms the bulk of the Bengal Paper Mill Company's production, but they also produce a higher proportion of wrapping paper than any other mill. Whereas the Titaghur Paper Mills Company have told us that they have now practically abandoned the production of wrappers as they find it cheaper to purchase their requirements, the Bengal Paper Mill Company consider it economical to utilize every particle of their raw material, namely grass, and they therefore have an elaborate system of strainers and filters which enables them to collect all the refuse which is packed with the grass as it arrives at the mill and this material they use in the manufacture of wrappers. The Upper India Mills concentrate particularly upon the production of badami papers and we understand that they have recently been supplying the requirements of the Bihar and Orissa Government in this respect.

Auxiliary materials.

12. Before considering the chief raw materials used by the industry in India we wish to mention the increasing use of indigenous auxiliary materials. In 1925 the Board found that most of the chemicals required for paper manufacture were available in India. Materials invariably purchased in India at that time were rosin, lime, magnesia, sulphuric acid and hydro-chloric acid while those which were sometimes purchased in India and sometimes imported included China clay, caustic soda, alkali, alum and alumino-ferric and common salt. The most important articles unobtainable in India were sulphur, dyes and bleaching powder. The position now is somewhat different. Sulphur (required by the India Paper Pulp Company) and bleaching powder still have to be imported, except that the Titaghur Mills manufacture their own bleach. But Indian China clay is now much more extensively used. The Titaghur Paper Mills Company have imported no China clay since 1928. The Bengal Paper Mill Company have used Indian China clay as far as possible but still find the quality variable. They propose to instal a new clay plant which will enable them to use only Indian clay. The India Paper Pulp Company have also used Indian China clay to some extent but find that, in spite of considerable improvement, it is still not wholly up to the standard they require and they point out that the importance of the quality is such that they prefer to pay Rs. 68 per ton for imported clay rather than Rs. 50 per ton for the best Indian clay. Alum is now mostly procured in India and at a lower price than imported alum, though the India Paper Pulp Company has experienced difficulty in obtaining assured supplies which are essential to the running of the mill. Generally speaking it appears that most of the important chemicals are now obtainable in India at economical prices.

Criticisms of use of imported pulp.

13. We now turn to an examination of the principal materials used at the different mills. The quantity of indigenous materials used at the mills as compared with that of imported pulp has been the subject of strong comment by the Calcutta Paper Import and Traders' Associations. Their criticism of this aspect of the working of the protective scheme forms an important element in their opposition to the case for protection put forward by the Indian mills. It is therefore necessary to state briefly their main contentions regarding this subject before we examine the progress made by the mills in the use of different kinds of materials. It has been stated that the increased use of imported pulp since 1925 shows that the mills have little faith in Indian raw materials despite the representations made by them to the Tariff Board. The imports of wood pulp since 1925 show a large increase which, it is suggested, means that the whole of the increased tonnage of paper turned out by the Indian mills was produced from imported material. It is argued that not merely have the mills no real confidence in the possibilities of Indian materials but also that no genuine Indian material suitable for the Paper industry is in existence and that the experience of the past six years shows that bamboo is not a satisfactory paper making material. It is further contended that the object of the Tariff Board and of Government in granting protection was to develop the use of bamboo pulp and paper and that the fact that so large a proportion of Indian made paper is manufactured from foreign material must be regarded as an indication that the scheme of protection has definitely failed. It is also suggested that the increased use of imported pulp has meant the employment of less Indian material and labour and therefore by implication has proved a source of economic loss to the country. Many of these allegations will be examined fully in other Chapters. We propose here to deal with them in so far as they relate to the use of Indian and foreign materials by the mills during the past six years.

Imported pulp and indigenous materials.

14. That the use of imported pulp has increased considerably since 1925 is an admitted fact as will be seen from Table VII on page 15 which shows the quantities of imported pulp used in 1924-25 and in 1930-31 in terms of finished paper. We made a point of asking for detailed information on this subject in our questionnaire and received full replies from the mills. The following Table shows at a glance the aggregate quantities in tons of the various materials used by the mills for the whole period from the year 1924-25 to the year 1930-31. We have also included in the Table the quantities of finished paper represented by each material. These figures are based upon actual yields obtained by the mills.

TABLE VI.

—	Bamboo.	Grass.	Rags.	Jute, Hemp, etc.	Waste Paper.	Total indigenous materials.	Imported pulp.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Titaghur Paper Mills Company.	7,530	107,158	4,539	3,459	13,794	136,480	68,431
Bengal Paper Mill Company	60	53,406	489	4,255	9,345	67,555	28,807
India Paper Pulp Company	27,825	...	...	...	428	28,253	18,971
Upper India Couper Paper Mills Company.	...	9,484	9,459	12,439	715	32,498	970
Deccan Paper Mills Company.	...	...	1,128	...	8,122	9,250	2,904
Andhra Paper Mills Company.	120	...	3	6	25	154	95
Total .	35,535	170,048	15,618	20,159	32,429	274,190	120,178
Average annual consumption.	5,077	24,293	2,231	2,880	4,633	...	17,168
Average annual yield in finished paper.	2,132	10,203	1,115	1,468	3,088	...	14,764

Clearly the most important indigenous materials so far as this enquiry is concerned are bamboo and grass. Since for the purposes of this Report what is of most importance is the yield of finished paper from the various materials, we have compiled the following table which shows the actual output of paper from bamboo and grass and other materials and also from imported pulp for the four principal mills in the years 1924-25 and 1930-31. The table also shows the percentage of the total output of finished paper represented by the various materials grouped as above. The figures have been supplied to us by the mills themselves and represent actual working. The figures for each year will be found in Appendix I.

TABLE VII.

Statement showing quantity of finished paper and percentage of output represented by various materials.

—	Bamboo.	Per cent.	Grass.	Per cent.	Other materials.	Per cent.	Wood pulp.	Per cent.
	Tons.		Tons.		Tons.		Tons	
1924-25.								
Titaghur Paper Mills Company.	0·63	...	5686	36·55	3147	26·70	5716	36·75
Bengal Paper Mill Company.	...	...	2626	41·36	1998	31·47	1725	27·17
India Paper Pulp Company.	1943	76·35	...	...	67	2·63	535	21·02
Upper India Couper Paper Mills Company.	...	...	407	23·92	1294	76·08	...	...
1930-31.								
Titaghur Paper Mills Company.	1842	9·56	5487	28·49	3409	17·70	8522	44·25
Bengal Paper Mill Company.	16	0·17	2918	31·65	1483	16·12	4801	52·06
India Paper Pulp Company.	1876	30·32	...	...	411	6·64	3901	63·04
Upper India Couper Paper Mills Company.	...	...	405	14·97	1996	73·76	305	11·27

Use of imported pulp not inconsistent with object of protection.

15. Before we proceed to explain the causes which have led to the increased use of imported pulp it is desirable to point out, in view of the allegations made by the Calcutta Paper Import and Traders' Associations, that the object of the Tariff Board in granting protection was primarily to afford facilities for the completion of the exploratory work on bamboo. In judging the use of imported pulp by the mills it is necessary to examine the position with reference to the object of protection as explained by the Tariff Board. What the Board had in view was that the experimental work on bamboo should continue and be developed so that " when the opportunity comes, it will not be necessary to spend years on investigation before the development of the Industry can begin ". On this view of the object underlying the protective scheme it is hardly reasonable to maintain that the increased use of imported pulp by itself is an indication that protection has failed. Before the scheme of protection can be regarded as having failed in its object it must be shown also that the use of imported pulp has prevented or retarded the exploratory work on bamboo. The true criterion for judging the effect of protection is the progress made by the mills in respect of the preliminary work on bamboo rather than the quantity of foreign pulp used by them. The progress which has been achieved so far

in the development of bamboo will be discussed in detail in a subsequent Chapter. Meanwhile it may be stated that, while the use of imported pulp has undoubtedly increased, there has also been substantial progress in the development of the plant and processes required for the mechanical and chemical treatment of bamboo and for its subsequent handling in the paper making stages of manufacture. The work has involved not merely a considerable amount of research and preliminary investigation but also large extensions to the plant and machinery. The total expenditure incurred by the mills on additions and improvements since 1925 amounts to Rs. 47 lakhs of which Rs. 13 lakhs have been spent in connection with bamboo pulp. A further expenditure of Rs. $3\frac{1}{2}$ lakhs on immediate extensions connected with bamboo pulp is also contemplated. The funds spent on these schemes of reconstruction and renovation have been made available largely as the result of the increased production of paper due to the use of imported pulp. If the mills had been dependent in the earlier years of protection entirely on bamboo pulp, any large increase in the output of paper would have been impossible. The difficulties experienced in the manufacture of bamboo pulp have been so great that not merely no surplus would have been available for extensions and improvements but the mills would have suffered serious losses in working. It is to the use of imported pulp that the progress shown in the development of bamboo and indeed the survival of the mills in the face of falling prices should be largely attributed.

Reasons for the increased use of wood pulp.

16. In explanation of the increased use of imported pulp the mills emphasize the fact that the Tariff Board in 1925 recommended not only a protective duty on paper but also direct financial assistance to the manufacturers of bamboo pulp. The omission of this assistance in the scheme of protection as put forward by the Government and accepted by the Legislature has undoubtedly encouraged the use of imported pulp and no direct incentive remained for the further development of bamboo as a paper making material. The imposition of a protective duty on paper while wood pulp is admitted duty free has naturally acted as a stimulus to an extended use of imported pulp. The tendency to use imported pulp has been further strengthened by the big fall which has occurred in its price. The effect which the downward trend has inevitably had upon the Indian mills becomes clear if we take the average values, as shown in the Trade Returns, of both pulp and imported protected paper:—

TABLE VIII.

	Imported Pulp.	Imported protected Paper.
	Rs.	Rs.
1926-27	227·2	521·3
1927-28	201·5	500·1
1928-29	185·9	499·7
1929-30	184·7	495·1
1930-31	185	497·1

It should be added that the price of pulp in the current year has fallen as low as Rs. 140. American pulp is quoted at even lower rates. This Table shows that while the drop in pulp prices has been 18½ per cent. that in the paper prices has been rather less than 5 per cent. As we show in Chapter III, these figures do not reflect adequately the fall that has taken place in market prices but it is clear that while the prices of paper have tended to follow those of pulp the gap between the two has made it increasingly advantageous for the Indian manufacturer to use larger quantities of imported pulp. This fall in price was not anticipated by the Board in 1925 when it seemed probable that an approaching shortage of the supplies of coniferous woods must in time cause a rise in the price of wood pulp though no forecast was made of the time within which such a rise might be expected. We shall deal more fully with this aspect of the matter in a later paragraph. For the present it is sufficient to say that production has outstripped demand, a factor which in conjunction with the general fall in the level of commodity prices in the last eighteen months has had a seriously depressing effect.

A small quantity of imported pulp indispensable.

17. While the circumstances explained in the preceding paragraph account for the increase in the use of imported pulp, it is necessary to mention that a certain amount of wood pulp is in any case indispensable in Indian mills under present conditions. According to their evidence the minimum annual quantities which will be required by the three chief mills when their renovations and reconstructions, either contemplated or already instituted, are complete will be as follows:—

	Tons.
Titaghur Paper Mills Company	2,400
Bengal Paper Mill Company	1,800
India Paper Pulp Company	3,600 (as equipped at present.)

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These figures, however, must not be taken as final and need some elucidation and modification. They are calculated upon the supply and quality of bamboo pulp as it is at present or can be envisaged in the near future. The reasons given by the mills for their requirements are firstly, that wood pulp is absolutely necessary for certain special high priced classes of paper and secondly,—and this is far more important—that it is essential to provide an insurance against breakdown in their own pulp making plant or a failure in the supply of indigenous pulp. In the event of such a breakdown or of labour troubles they must have some reserve so as to keep the paper making plant in full operation. So far as the first reason is concerned, it would appear that there is no likelihood of a time when wood pulp can be dispensed with entirely. But the output of this kind of paper is so small that from 5 to 10 per cent. of the total pulp requirements of any mill would probably be sufficient to meet the demand. As regards the second reason, the mills have stated in evidence that bamboo pulp would serve the purpose equally well provided such pulp is put on the market in sufficient quantity and in a form which makes it suitable for storage. It is therefore possible that if a bamboo pulp industry materialises in India on a reasonably large scale the mills' requirements of wood pulp would be not more than 5 to 10 per cent. of the total production.

The use of imported pulp an advantage to the country.

18. Before concluding our examination of the use of imported pulp by the mills, the extent to which it has assisted the increased employment of Indian labour and materials may be briefly indicated. The approximate total output from the Indian mills has increased from 25,000 tons in 1925 to 40,000 tons in 1931. This increase has involved the employment of additional labour and the distribution of larger sums in wages. In 1925, the number of persons employed daily in the mills was 5,251; the figure to-day is 6,696, an increase of 1,445. In 1924-25 the three mills in Bengal between them paid in mill wages Rs. 11,65,637. In 1930-31 they have paid Rs. 13,76,628, an increase of Rs. 2,10,991. The use of wood pulp for conversion into paper has meant a definite increase in the use of Indian materials and labour. The extent of this increase may be illustrated in the case of the Titaghur Paper Mills Company from whom we obtained their 1930-31 costs of converting pulp into paper excluding the cost of imported auxiliary materials. The figure they have given us is Rs. 121·315. Whatever pulp is used the cost of converting it into paper is approximately the same. If, therefore, we apply this figure to the total quantity of imported pulp used by the mills we shall arrive at an approximate estimate of the extra money spent in India on account of the use of imported wood pulp. In order to make the estimate a conservative one we have reduced the figure supplied by the Titaghur Paper Mills Company by Rs. 5 per ton on account of covenanted European labour employed on the conversion process. The calculation shows that during the last seven years approximately Rs. 20 lakhs annually has been spent on Indian materials and labour in converting imported pulp into paper. Had this paper not been manufactured in India not only would the money for its purchase have been spent abroad but also the Indian labour and materials would not have been employed.

The supplies of wood for pulping.

19. The Board in its Report in 1925 stated that it was reasonable to anticipate a shortage in the world supplies of coniferous woods available for pulp manufacture and a consequent rise in the price of imported pulp in India. No estimate was attempted of the period within which these anticipations were likely to be fulfilled but the general conclusion was stated as above. In considering the development of bamboo as a material for paper making it is obviously important to examine the present position as regards supplies of rival materials. Since the Board's forecast of the course likely to be taken by the prices of wood pulp has not yet proved correct, we have made the best attempt possible in the time at our disposal to determine why the trend of prices has been

steadily downward and what the actual position is in regard to the supplies of wood suitable for pulp manufacture. At the time of the previous Report the price of imported wood pulp (easy bleaching sulphite) was in the neighbourhood of £15 to £15-10 per ton c.i.f. Calcutta, and this price at the time was looked upon as definitely a low one. At the present day the average price for Scandinavian pulp of the same type is about £10-10 per ton c.i.f. Calcutta and we have come across a quotation for American pulp, also easy bleaching sulphite, of £9-7-6. It is clear that some part of this fall must be due to the general depression in all commodity markets, but even before this depression could have been seriously felt the price had come down to the neighbourhood of £13. The results of an interesting examination of the position of the wood pulp market will be found in an article by Professor Frazer Story of the Forestry Commission, London, which we reproduce in Appendix II. The article discusses the production and consumption of soft woods in the British Empire and in the rest of the world and the position is summarized in the following Table:—

TABLE IX.

Accessible Conifer Forests (Estimated).

	Approximate resources in million cubic feet.	Approximate annual consumption in million cubic feet.
United States of America	390,000	12,000
Canada	100,000	3,200
Europe	285,000	8,000
Siberia	100,000	1,000
Other regions	110,000	1,500
Total	985,000	25,700

Professor Frazer Story proceeds from this Table and, assuming that losses by fire and insects and indiscriminate cutting counterbalance the average present annual increment, draws the conclusion that at the present rate of consumption very little will remain of the accessible virgin forests in forty years. This estimate, it may be noted, does not take into consideration any increase in the rate of consumption. We may also quote from an article by Mr.

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George G. Wheat in "The Pulp and Paper Magazine" dated 2nd January, 1930. He says "We compare the United States with Canada. Bulletin 21, U. S. Department of Agriculture, Table 8, page 8 shows that we (*i.e.*, the United States) have a present total timber stand of 745,558,000,000 cubic feet, Canada has 246,826,332,000 cubic feet. We are decreasing our supply by use and loss at a rate that will wipe it out in 45 years. Canada by the same measuring rule can last 49 years. This takes into consideration increment and use and all losses but no increased consumption of forest production". Obviously there is a difference in the method of calculation as will be seen from a comparison of the figures given by Professor Frazer Story for the resources in the United States of America and in Canada, but the conclusions drawn are substantially similar. We have been able to obtain certain figures regarding the "increased consumption of forest production". They are as follows:—

TABLE X.

	Cords cut.	Pulp manufactured.
*United States of America**—		
1919	4,445,817	3,517,952
1926	5,489,517	4,394,766
Canada†—		
1920	4,024,826	1,960,102
1929	6,536,335	4,021,229

That is to say, in the United States in seven years there was an increase of over 1,000,000 cords cut and of nearly 900,000 tons of pulp manufactured; and in Canada in nine years an increase of 2,500,000 cords cut and of over 2,000,000 tons of pulp manufactured. We have quoted no figures for Scandinavian countries. All authorities that we have had an opportunity to consult are of opinion that the forest conservation and regeneration methods adopted, certainly in Sweden and probably in Finland too, are such that the amount cut will not be allowed to exceed the annual increment and that those countries will probably be able at least to maintain their present production. It is true that most of the pulp now imported into India comes from Scandinavia but we have shown that American quotations are already in the market and at an attractive price. So far as Russia is concerned we feel that such figures as we have seen do not enable us to form a useful opinion. In a memorandum on the Five Year Plan compiled by Mr. W. P. Coates, Secretary of the Anglo-Russian Parliamentary Committee, it is stated—

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* United States of America, Department of Agriculture Bulletin.

† Canada, Department of Trade and Commerce—Dominion Bureau of Statistics, Forest Product Branch. The Pulp and Paper Industry, 1928-29.

NOTE.—One cord = 128 cubic feet.

> " The timber area of the Union covers 877 million hectares without counting the woodland areas which are of local importance only. Of this area only 157 million hectares are being industrially exploited, or less than a fifth of the total forest area of State importance. At the end of the five year period an additional 35·6 million hectares are to come under exploitation."

Without knowing how much of this area is economically exploitable we feel we cannot make any satisfactory use of these figures but we are inclined to the view that the suggestion that Russia is cutting irrespective of increment or regeneration in order to raise capital for industrial development may not be wide of the mark. It is of interest to note that so far as the British Empire is concerned the position was fully discussed in the House of Commons on the 20th November 1929 and a resolution was accepted by Government to the effect that the state of the timber resources of the Empire demanded His Majesty's Government's serious attention. We think it may be safely assumed that generally speaking production throughout the world has been following the lines suggested by the figures for Canada and the United States of America; it may be noted that the United States of America is responsible for the production of approximately half the world's supply of paper. The fact therefore is that there has been considerable overproduction of pulp, the market has been flooded and the price depressed. This indeed can be the only reason for the recent restriction scheme agreed upon by pulp manufactures in Norway, Sweden, Finland, Germany, Austria and Czechoslovakia who last autumn decided to curtail production by 15 per cent. and have now agreed to reduce it by a further 15 per cent. As a result of this restriction there should be next year 900,000 tons less of sulphite pulp in the world market.

So far as the supplies of wood for pulp manufacture are concerned we should hesitate to express any definite and considered opinion. Restriction schemes and a resulting rise in prices may have a real and beneficial effect. Strict forest control and effective regeneration schemes may be enforced in the pulp producing countries though, if Professor Frazer Story's estimate is correct, in view of the fact that it takes the normal coniferous tree approximately sixty years to arrive at a suitable age for the manufacture of pulp they may be too late. On the other hand such improvements as these may well be counter-balanced by the increase in the world's population and the rapidly growing demand for paper. On such information as is available it is reasonable to anticipate a shortage of wood and a consequent rise in the price of imported pulp but we do not think there is sufficient evidence to justify any attempt to estimate the period within which these anticipations are likely to materialise.

The financial position of the Indian mills.

20. We have examined the financial condition of the Companies during the period of protection. The following Table shows the aggregate amounts set aside for depreciation, placed to reserve and distributed as dividends during the years 1924-25 to 1930-31. We have no figures for the Andhra Paper Mills Company.

TABLE XI.

	Depreciation.	Reserve.	Dividends.
	Rs.	Rs.	Rs.
Titaghur Paper Mills Company .	34,47,185	3,84,433	12,10,881
Bengal Paper Mill Company .	9,76,887	3,75,000	8,72,375
India Paper Pulp Company .	20,56,386	...	...
Upper India Couper Paper Mills Company	3,22,806	49,433	3,60,000
Deccan Paper Mills Company (1924-25 to 1929-30)	56,332	15,000	27,200

The Titaghur Paper Mills Company underwent financial reconstruction in 1925-26, when the nominal value of their ordinary shares was reduced from Rs. 10 to Rs. 2-8 each, and that of their preference shares from Rs. 100 to Rs. 40 each, while the interest on their preference shares was raised from 6 to 8 per cent. and a fresh issue was made of deferred shares. These deferred shares are not entitled to any dividend until the ordinary shareholders have received 10 per cent., when half of any surplus is distributed to the holders of deferred shares. In 1928 a fresh issue was made of 8,160 8 per cent. preference shares of Rs. 100 each. The Company's block at the time of reconstruction stood at Rs. 62·96 lakhs. After taking into account the value of additions and the Rs. 34·47 lakhs by which it has been depreciated, it now stands at Rs. 41·76 lakhs. The Company have throughout paid interest on their 8 per cent. preference shares, while on their ordinary shares they have in the last three years paid interest at the apparently high rates of 25 per cent., 40 per cent. and 35 per cent; but as the nominal value of these shares has been written down by 75 per cent., a return of 40 per cent. on the present value represents only 10 per cent. on the original value. The Company have paid interest on their deferred shares for the last three years at 26 per cent., 37 per cent. and 34 per cent. and have reduced their loan from the Bank from Rs. 47·35 lakhs as shown in the balance sheet of March 31st, 1925, to Rs. 17·31 lakhs as on March 31st, 1931.

The Bengal Paper Mill Company had in 1903-04 reduced the nominal value of their ordinary shares by 75 per cent., and that of their preference shares by 50 per cent., at the same time raising the rate of interest on their preference shares from 6 to 7 per cent. Before 1925 they had increased their ordinary capital by Rs. 6 lakhs, and in 1927-28 they issued 4,000 new 7 per cent. preference shares of Rs. 100 each. The Company's block as at 31st December 1924, stood at Rs. 13·29 lakhs. It has since been depreciated by Rs. 9·77 lakhs, and with the value of new additions it now stands at Rs. 14·05 lakhs. The Company have paid interest for each year on their 7 per cent. preference shares (though the interest for 1924 and 1925 was paid only in 1926) and from 1927 onwards they have paid interest on their ordinary shares at 7½ per cent., 17½ per cent., 20 per cent., and 20 per cent. Of the ordinary capital of Rs. 9 lakhs, Rs. 3 lakhs represent 25 per cent., of the original capital of Rs. 12 lakhs; and a dividend of 20 per cent., on the present value is equivalent to a dividend of 10 per cent., on the original value of Rs. 18 lakhs. In 1924 the Company had a loan of Rs. 4·52 lakhs from the Bank: since December 1926 no such liability has appeared in their balance sheet.

The India Paper Pulp Company have neither paid any dividends nor placed any sum to reserve and there is a debit balance in their Profit and Loss Account amounting on March 31st, 1931, to Rs. 7·78 lakhs. The Company's block on 31st March, 1925, stood at Rs. 38·93 lakhs; with depreciation of Rs. 20·56 lakhs (and special depreciation in 1926 of Rs. 5 lakhs) and after allowing for the value of additions, it stands on March 31st, 1931, at Rs. 26·01 lakhs. Again, on March 31st, 1925, the Company were liable for advances amounting to Rs. 26·46 lakhs; between 1926 and 1928, they borrowed another Rs. 10 lakhs to enable them to pay for a new paper machine; they have been able to repay Rs. 3 lakhs of these Rs. 10 lakhs and have reduced the amount advanced by the Managing Agents from Rs. 16·10 lakhs to Rs. 2·08 lakhs.

The block of the Upper India Couper Paper Mills Company at Lucknow on December 31st, 1924, stood at Rs. 4·84 lakhs; after taking into account Rs. 3·23 lakhs depreciation and the value of additions it stood on December 31st, 1930, at Rs. 2·73 lakhs. Since 1925 the Company have paid interest on their special capital of Rs. 8 lakhs at rates varying from 6 to 10 per cent. During the six years the Company have invested about Rs. 8 lakhs, increasing their resources in securities and in cash from Rs. 6·31 lakhs in 1924 to Rs. 11·58 lakhs in 1930.

The Deccan Paper Mills Company's block as on March 31st, 1925, was Rs. 8·01 lakhs; on March 31st, 1930, it stood at Rs. 8·68 lakhs after allowing for additions and for depreciation to the extent of Rs. ·56 lakhs. The Company have paid no dividend since 1924-25 when they paid at the rate of 3 per cent. They have made a small profit each year since but have preferred to let their profit go to the working of the mills.

Surplus of prices realised over works costs.

21. We shall discuss in a later Chapter the present level of works costs in the mills, but it will be of interest here to see how far the surplus over works costs of the prices realised agrees with the forecast made by the Board in 1925. We give the figures only for the three Companies for which such forecasts were made.

TABLE XII.

Statement showing the surplus of prices realised over works costs per ton of paper made.

	Titaghur Paper Mills Co.	Bengal Paper Mill Co.	India Paper Pulp Co.
	Rs.	Rs.	Rs.
1925-26	103·39	10·18	62·72
1926-27	101·66	75·54	91·21
1927-28	97·57	77·49	110·49
1928-29	114·17	95·51	145·25
1929-30	114·38	89·98	147·91
1930-31	99·95	90·63	140·68
Average surplus for the six years	105·35	76·62	127·05

The Tariff Board in its report of 1925 estimated that in arriving at a fair selling price for the Indian mills the allowance for overheads should be taken at Rs. 85 per ton and for profit at Rs. 64 per ton, a total of Rs. 149 above works costs. It will be seen from the foregoing Table that no Mill has been able to cover these estimated charges, though it must be pointed out at the same time that with a duty of Rs. 140 per ton the Board did not expect the mills to show profits. The works costs may be compared with the estimate of future costs made by the Board in 1924. The Titaghur Paper Mills Company then estimated their future works costs at Rs. 392, but the Board was inclined to the view that this was an optimistic estimate and did not expect the figure to fall below Rs. 400 save in exceptionally favourable circumstances. The figure now is Rs. 360. The Bengal Paper Mill Company anticipated a reduction from Rs. 519 to Rs. 459; their present figure is Rs. 350. The India Paper Pulp Company estimated their future costs at Rs. 349 on an output of 5,000 tons of paper or Rs. 340 if their output reached 5,500 tons, but the Board again thought this an optimistic estimate and preferred to put the figure at Rs. 360. On an output of over 6,000 tons of paper the works costs are now Rs. 330. We reserve a detailed consideration of the causes which have led to these reductions for a later Chapter.

The India Paper Pulp Company.

22. In paragraph 142 of the previous Report the Board made a forecast of the prospects of the India Paper Pulp Company on the assumption that they would raise or be provided with the additional capital required to double their output and that they could sell their whole output at an average price of Rs. 560 per ton. The Board recommended that Government should advance or guarantee the additional capital required subject to a maximum of Rs. 10 lakhs at 6 per cent. and should waive payment of interest by the company for the first two years of the loan. It was considered by the Board that the proposed facilities should enable the company to increase their output to 4,000 tons in the third year

of protection and to 5,000 tons in the fourth year with a resultant reduction in overhead charges from Rs. 122 to Rs. 100 per ton in the third year and Rs. 85 per ton in the fourth year. Out of this saving, however, in the third and fourth years Rs. 15 and Rs. 12 respectively would be absorbed by the interest payable on the additional capital. For the purpose of its forecast the Board assumed a reduction in works costs of Rs. 42 per ton in the third year and a further Rs. 40 per ton in the fourth year. It was admitted that these hopes might easily prove too sanguine but the savings were considered possible with intense effort, rigid economy and efficient management. The following statement shows exactly how the forecast was constructed—

TABLE XIII.

—	1st year.	2nd year.	3rd year.	4th year.	5th year.
Output in tons . . .	2,500	2,500	4,000	5,000	5,000
Price realised . . Rs.	560	560	560	560	560
Less works cost . . „	442	442	400	360	360
„ Overheads . . „	122	122	100	85	85
„ Interest on new capital „	..	..	15	12	12
Profit per ton . . „	—4	—4	+45	+103	+103

The Board thus calculated that the Company might expect to realise, after providing fully for depreciation, meeting all charges and paying interest on the new capital, an aggregate profit of Rs. 250 per ton over the last three years or an average profit of Rs. 50 per ton over five years. By calculating the profit or loss on the actual output of each year we get an average profit for the period of Rs. 62·63 a ton, which with an output of 5,000 tons represents a return of a little over 10 per cent. on a capital of Rs. 31 lakhs which was the estimated replacement value of the then existing buildings and plant.

We now have the actual figures showing what the Company have been able to achieve and how far the forecast has been realised. Government having rejected the recommendation for direct financial assistance, the Company were compelled to turn elsewhere for the additional capital required and arranged to borrow Rs. 10 lakhs at 6½ per cent. With the capital thus raised a second paper machine was erected. Contracts were placed early in 1926 and paper was first made on the new machine in July 1927. The output of paper contemplated by the Board has been more than realised, the production in the fourth year being 5,892 tons against the Board's estimate of 5,000 tons. The following Table showing actual results has been drawn up in the same form as the Table explaining the forecast—

TABLE XIV.

	1st year.	2nd year.	3rd year.	4th year.	5th year.	6th year.
Output in tons . . .	2,378	2,586	4,358	5,892	6,056	6,188
Price realised . . Rs.	508	511	489	491	475	471
Less works cost . . „	445	419	379	346	327	331
„ Overhead . . „	118	111	78	65	63	62
„ Interest on new capital „	3	12½	15	11	11	11
Profit per ton . . „	—58	—31½	+17	+69	+74	+67

It should be explained that the overheads have been so calculated as to be as nearly as possible comparable with the figures in the Board's estimate of 1925. Depreciation has been calculated at 6¼ per cent. on a block of Rs. 31 lakhs. Interest on working capital has been based on the assumption that the cost of eight months' output is equivalent to the working capital required and interest has been allowed at 7½ per cent. For head office and managing agents' remuneration we have adopted a standard figure of Rs. 15 per ton throughout, this being the figure adopted by the Board in 1925. The new capital raised by the Company was borrowed in instalments, Rs. 1 lakh in 1925-26, Rs. 4 lakhs in 1926-27 and Rs. 5 lakhs in 1927-28; the interest has been charged accordingly. It will be noticed at once that at no time has the Board's assumed price of Rs. 560 been realised and that present prices fall short of that figure by Rs. 90. Works costs are lower than the forecast; and so are overheads and interest on new capital, due to the greater outturn of paper; the losses in the earlier years are much heavier than was anticipated and the profits of the later years are not up to expectations. Accordingly if we calculate the profit or loss on the actual outturn of each year by the method adopted in the case of the forecast, we find that the result of the six years' working is an average profit of Rs. 40·94 a ton instead of Rs. 62·63; and with an outturn of 6,000 tons of paper this gives a return of just under 8 per cent. on a replacement value of Rs. 31 lakhs. This figure practically corresponds with the average surplus of the Company as shown in Table XIII less overheads at Rs. 85 as estimated by the Tariff Board in 1925. We find that the Company have very nearly succeeded in attaining what to the Board in 1925 seemed an ideal hardly possible of achievement.

The burden imposed on the consumer.

23. The method by which the Board estimated the probable additional burden on the consumer resulting from the protective duty is set forth in paragraph 158 of the Report of 1925. We propose now to consider how far this estimate has been realised. In paragraph 46 of the previous Report the Tariff Board estimated the average prices likely to be realised by the three big Indian mills with the duty at 15 per cent. We have now obtained figures for the actual average prices realised for the whole period from 1924-25 to 1930-31 and we compare the two in the following statement:—

TABLE XV.

	Board's Estimate per lb.	Average realised price per lb.
	A. P.	A. P.
Titaghur Paper Mills Company	3 7	3 4·25
Bengal Paper Mill Company	3 5	3 3·6
India Paper Pulp Company	3 8	3 5·49

Converting these prices into rupees per ton the average price realised by the three mills works out at Rs. 472 per ton. So far as the estimated figures are concerned, we have arrived at a comparable figure of Rs. 496 per ton assuming an output by the mills then of five-sixths of their maximum output as stated by them to the Board at the time. The consumer therefore has paid Rs. 24 per ton less for Indian made paper than was anticipated by the Board and the Legislature with a revenue duty of 15 per cent. The output of these mills during the last five years has been 158,350 tons of paper which at Rs. 24 per ton gives a figure of Rs. 28,00,400. During the same period the imports of protected classes of paper have amounted to 88,253 tons. It is reasonable to assume that the variations in the prices realised by the mills correspond closely with the variations in the price of imported protected paper. We may therefore apply the same difference of Rs. 24 per ton to the imports of protected paper, the resultant figure being Rs. 21,18,072. There has thus been a burden imposed on the country less than the anticipated burden by Rs. 49,18,472 over five years or Rs. 9,83,694 annually. It is true that in these calculations have been included the unprotected papers manufactured by the mills in India but the amount is so small that it has not seemed worth while to calculate it separately and we think it is a safe estimate to make that the burden has been less by Rs. 9½ lakhs annually than was anticipated. It should be noted that this calculation is based on an estimated price of Rs. 496 per ton which assumed a revenue duty of 15 per cent. If the prices anticipated under the protective duties were taken into consideration the reduction would be about three times as large. It is obvious that if there had been no protective duty the burden on the consumer would have been still less. What these figures, however, establish is that, compared with the increased prices which were estimated to result from the duty, the scheme of protection has proved less onerous than was expected.

The Printing industry.

24. It was urged before the Board in 1925 that a duty on paper and the consequent rise in price would damage the printing industry in India and cause publishers to get their work done outside the country, and a similar statement has been made to us in the course of the present enquiry. At the time it recommended the protective duties the Board considered that the apprehensions of this industry were exaggerated. We have attempted to obtain information on this point and though the data with which we have been supplied are somewhat scanty we think there can be no doubt that the Board's original opinion was correct and that the industry has not been adversely affected. The Bangalore Printing and Publishing Company have supplied us with the following interesting statistics:—

TABLE XVI.

Year.	Number of printing presses working.	News-papers.	Books.	
			English.	Indian.
1923-24	4,909	1,363	2,237	13,802
1924-25	5,312	1,401	2,302	14,728
1925-26	5,362	1,378	2,117	14,296
1926-27	5,724	1,485	2,147	15,246
1927-28	5,919	1,525	2,332	14,815

We endeavoured to obtain information on this point from various British publishers also and addressed Messrs. MacMillan and Company, Messrs. Longmans, Green and Company and the Oxford University Press. We were unable to obtain definite data but, while the Manager of the Oxford University Press subscribes on general grounds to the view that the duty on printing paper must have affected publication in India and states that he has on occasion found it advantageous to get printing done in England, Messrs. Longmans, Green and Company state that their experience is that the printing done by them in India will in 1930-31 probably be five times as much as that done in 1924-25 and that the quality of Indian made paper has improved so markedly that they now require only a small quantity of imported paper for special purposes. We are satisfied that the printing industry has suffered no undue handicap by the imposition of the protective duty.

CHAPTER III.

The Indian Market and the Course of Prices.

The market claimed by the Indian mills.

25. In 1925 the Tariff Board estimated that the market in India capturable by the Indian mills was 30,000 tons at the outside and probably a great deal less. This estimate referred, of course, to conditions existing at the time; it could not and did not take into account any future increase in annual consumption which was almost impossible of prediction with any accuracy. In the course of the present enquiry we asked the mills to make further estimates of the market which they considered they could reasonably expect to capture or, at least, for which they could supply the required kinds of paper. Both the Lucknow and the Andhra Mills estimated that the Indian industry could supply another 50,000 tons of the paper consumed but the calculations they had made were obviously incomplete and in oral evidence it was made clear that this was probably an overstatement. The Deccan Paper Mills Company based their calculations upon the trade figures for 1929-30, their contention being that the figures for 1930-31 are abnormally low and do not represent the true demand in India. They consider that all the imports of protected printing paper, 66 per cent. of the imports of writing paper and 66 per cent. of the imports of packing paper are likely to be manufactured in India. On this basis they arrive at a total figure of approximately 25,000 tons. The Bengal Paper Mill Company also prefer to take the 1929-30 figures as representing more accurately the true Indian demand and consider that at least 20,000 tons of the paper and boards now imported could be manufactured in India. They lay particular stress on the possibility of the manufacture in India of packing papers composed of the qualities known as Kraft and Imitation Kraft papers. The Titaghur Paper Mills Company estimate that of the imports of paper excluding paste board in 1930-31 25 per cent. represents paper made or likely to be made in India, the actual tonnage being 25,000. They also consider that at least some proportion of the paste board imported can be supplied by Indian manufacturers but they give no actual figure. They also give Indian mills credit in their calculations for a possible production of Kraft papers. The Indian Paper Pulp Company base their estimates upon a consideration of each class of paper separately. With regard to packing paper they say that they themselves have no direct knowledge of what can be manufactured in India and they have therefore omitted it from their estimates but that it is quite possible that a considerable proportion could be made in India. Similarly with regard to boards they believe that a pro-

portion of paste board, mill board and card board could be made in India or alternatively that the card board now manufactured in India would be equally suitable for some of the purposes for which imported boards are now used but they prefer to make no estimate on that account. So far as the imports of writing paper and printing paper other than newsprint are concerned, both protected and unprotected, they have applied certain percentages based upon experience in the market and upon a comparison of the average prices of the imported papers with the average Indian selling prices, the actual percentages they claim being 70 per cent. of the protected writing papers, 70 per cent. of the unprotected printing papers and 85 per cent. of the protected printing papers. On these calculations and taking the import figures for 1930-31 they arrive at the conclusion that there is a market for 14,979 tons of paper which the Indian mills can capture. If they had taken the import figures for 1929-30 by the same method of calculations their claim would have amounted to about 20,000 tons. We believe that more accurate results are likely to be obtained if the estimate is based on the figures for 1929-30 rather than on the figures for 1930-31. As has been shown in Chapter II, the increase in consumption since 1924-25 was both noticeable and steadily maintained until the present severe trade depression affected almost all commodities. Taking, therefore, the figures for 1929-30 and omitting the classes of paper which are now either not produced in India or produced only in very small quantities, the figures of imports are as follows:—

	Tons.
Writing paper and envelopes (protected) . .	11,546
Printing paper other than newsprint (protected) . .	8,171
Printing paper other than newsprint (unprotected)	7,817
Total .	27,534

It is a matter of considerable difficulty to arrive at the proportion of this market which will be open to capture by the Indian mills. These figures include on the one hand papers of special quality which the Indian mills are not equipped to produce and on the other hand considerable quantities of inferior papers which they cannot produce at competitive prices even with a protective duty. We consider on the whole that a reasonable estimate of the additional market within the reach of the Indian mills is about 20,000 tons.

The fall in the prices of paper.

26. The fall in the prices of imported paper is illustrated by the following extract

from the official Trade Returns which give for each year the quantity of paper imported and its average value:—

TABLE XVII.

	Average price in rupees per ton in							Percentage of difference between prices of 1925-26 and those of 1930-31.
	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	
Packing paper .	402·1	401·4	385·9	399·4	369·5	345·8	333·1	—17
Printing paper—								
Protected .	385·7	458·6	428·9	418·9	421·9	418·6	410·3	—11
Not protected .		337·4	296·5	269·5	268·9	275·9	259·2	—23
Writing paper—								
Protected .	661·7	657·7	599	559·8	564·3	552·0	577·6	—12
Not protected .		672·6	932·7	941·5	915·0	763·9	799·4	+16
Total paper protected.	...	542·3	521·3	500·1	499·7	495·1	497·1	—8

There has been a marked fall in the price of each class of paper except the more expensive writing papers. The quantity of this class of paper imported each year is not much more than 500 tons, so that the rise in the price of this small class cannot affect the truth of the statement that the price of imported paper as a whole has fallen. A similar decline in prices is revealed by the statement of the Paper Import Association, who quote the following prices for typical classes of imported paper:—

TABLE XVIII.

Class of Paper.	Price per ton in 1926.		Price per ton in 1931.			Percentage of variation.
	£	s.	£	s.	d.	
Free Printings . .	30	16	27	0	0	–12
Account Book Paper .	34	0	28	0	0	–18
Imitation Art . .	34	0	34	6	6	+ 1
Feather Weight Antique . .	38	10	36	10	0	– 5

It is, however, doubtful whether these figures show the full extent of the fall in prices; for some individual dealers quote figures indicating a fall of 25 per cent. and more in the prices of 1931 as compared with those of 1926, and the prices which these dealers mention as obtaining in 1931 agree very closely with those quoted by the mills as the present prices of the classes of paper which compete with their products. White printing paper is said to be imported at prices ranging from £21-10 to £26-15; Account book paper at £22-12-6; writing papers (Cream Laid, Azure Laid and Antique) at prices ranging between £22-10 and £31; while the mills also complain of the import of unglazed newsprint, white and coloured, at prices between £12-17-6 and £18-12-6 which are said to have largely captured the market of the badami paper produced by the Indian mills. But though there is this variation in the estimate of the actual fall in prices, there is no doubt that prices have fallen at least to the extent indicated by the average prices given in the Trade Returns. The Tariff Board in 1925 observed that during a period of falling values the mills had constantly been compelled to cut prices in the hope of stimulating sales, while the dealers in imported paper had always a sufficient margin to come down to a lower level without sacrificing profits, with the result that at the new level the mills might maintain but could not increase their output. The position appears to be different to-day. The larger mills are all working to their full capacity; their works costs have been substantially reduced; and the mills themselves admit that their prices are fixed not so much with regard to the cost of manufacture as in relation to the price of imported paper of similar quality.

Freight advantage of Indian mills.

27. The principal paper mills have been granted special freight rates by railways on paper despatched to up-country stations. On the East Indian Railway special rates are quoted for 'wagon load' and 'less than wagon load' consignments of paper from—

(1) Naihati and *viâ* for the products of the mills at Naihati, Titaghur and Kankinara.

(2) Raniganj for products of the Bengal Paper Mill Company.

(3) Lucknow for products of the Upper India Couper Paper Mills Company.

(4) Howrah for traffic in general.

The special character of these rates is shewn by the following comparison of the rates from Howrah with those from other stations:—

TABLE XIX.

From	To Gaya. Rate per maund per mile.		To Cawnpore. Rate per maund per mile.		To Delhi. Rate per maund per mile.		To Lahore. Rate per maund per mile.	
	Wagon loads.	Small lots.	Wagon loads.	Small lots.	Wagon loads.	Small lots.	Wagon loads.	Small lots.
	Pies.	Pies.	Pies	Pies.	Pies.	Pies.	Pies.	Pies.
Titaghur . .	·24	·28	·16	·19	·16	·19	·23	·23
Raniganj . .	·22	·26	·15	·18	·15	·18	·20	·23
Howrah . . .	·45	·45	·30	·43	·21	·34	·24	·35

Consignments from Howrah to places as far up-country as Cawnpore are charged about double the rates payable on consignments from the mills. In the case of consignments to places beyond Cawnpore the difference is not so great except on 'less than wagon load' consignments.

A comparison of the rates per lb. is made in the following table:—

TABLE XX.

Station to	Excess of rates per lb. charged from Howrah over those from Titaghur.		Excess of rates per lb. charged from Howrah over those charged from Raniganj.	
	Wagon loads.	Small lots.	Wagon loads.	Small lots.
	Pies.	Pies.	Pies.	Pies.
Patna	1	·85	1·28	1·17
Gaya	·77	·62	1·14	1·04
Benares	1·30	1·14	1·35	1·17
Allahabad	1·35	1·54	1·63	1·85
Cawnpore	1·13	1·89	1·41	2·21
Agra	·84	1·87	1·12	2·28
Delhi	·63	1·72	·91	2·03
Amritsar	·19	1·69	·79	1·97
Lahore	·17	1·66	·79	1·96
Rawalpindi	·17	1·65	·79	1·97

The 'Wagon load' rates show a difference of about a pie a lb.; while the difference on the rates for small lots ranges from 1½ to 2 pies a lb. Similar concession rates on paper or special station to station rates are granted by other railways including Great Indian Peninsula Railway, Bengal Nagpur Railway, Bengal North-Western Railway, South Indian Railway and Madras and Southern Mahratta Railway. It should be mentioned however that from September 1st the East Indian Railway have raised the freight rates on paper.

Purchases by the Controller of Printing and Stationery.

28. Since 1924-25 the Indian mills have improved their position in the matter of purchases by the Controller of Printing and Stationery on behalf of the Government. The Controller buys for the Central Government, for certain local Governments and for some Railways. The quantities

purchased each year since 1925-26 in India and from abroad with the average prices are shown in the following statement:—

TABLE XXI.

—	Purchased in India.		Purchased abroad.		Percentage of total requirements bought in India.
	Tons.	Average price per ton.	Tons.	Average price per ton.	
		Rs.		Rs.	
1925-26	6,864	512	1,989	448	78
1926-27 . . .	7,624	500	470	464	94
1927-28 . . .	9,505	488	275	435	97
1928-29	9,795	475	427	401	96
1929-30	10,777	477	318	404	97
1930-31	10,392	475	568	333	95
1931-32 (contracted for) .	10,300	465	270	298	97

Not less remarkable than the increase in the quantity of paper purchased from Indian mills is the decline in the average price of the paper purchased abroad, showing that most of the better qualities of paper can now be procured in India. It will be noticed that the Controller buys about 25 per cent. of all the paper made in all the Indian mills. In 1924 he told the Tariff Board that it was his practice in placing contracts to allow the Indian mills a 5 per cent. preference to cover the fact that local purchase saved him from the need to carry large stocks. He has now stated that this preference has been dropped, so far as protected papers are concerned, since the protective duty was imposed. But in oral evidence he made it clear that what had really happened was that the preference of 5 per cent. had fallen into disuse because no case now arises for the exercise of the indulgence. When comparing tenders he immediately eliminates all foreign quotations above the quotations of the Indian mills. In the case of quotations not higher than the Indian quotations the papers are submitted to analysis and test and in all cases he has found that the cheap foreign quotations do not come up to the Indian standard and they are then rejected on account of quality. He has also stated that had it been the case that the price and quality of imported paper approximated to those of the Indian mills he would have taken up the question of the dropping of the 5 per cent. preference and would have obtained the orders of the Government of India to reintroduce it. The prices at which contracts were given to Indian mills for each of these classes of paper compare as follows with the lowest quotation of European manufacturers. The Indian prices are f.o.r. mill sidings and free delivery in Calcutta; the import prices include all charges landed at Calcutta:—

TABLE XXII.

—	1929-30.		1930-31.		1931-32.	
	Indian price per lb.	Lowest import price per lb.	Indian price per lb.	Lowest import price per lb.	Indian price per lb.	Lowest import price per lb.
	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.
White printing	3 7	3 7	3 6	3 6½	3 5	3 1⅜
Unbleached printing . .	3 5½	3 7½	3 5	3 0¼	3 4	3 4⅞
Badami	3 0	3 5	3 0	3 0¼	2 11	2 4

In the specifications issued by the Controller prior to 1930-31 it was required that for certain classes of paper a proportion of 30 per cent. sulphite wood pulp must be used. This was based on the fact that that amount of wood pulp gave a cleaner and better finished paper. From 1930-31 onwards, however, this specification has been dropped and intimation is given that preference will be shown to paper made as far as possible from indigenous fibres.

The prices in up-country markets.

29. It was noticed by the Tariff Board in 1925 that the price of Indian paper was the same in the up-country markets as in Calcutta; and the explanation of this feature was found to be the practice of the mills—in their attempt to increase their output—of unloading their surplus stocks at unremunerative prices in the less important markets. The following statement now furnished by one of the mills shows the prices which it has obtained at various places during the last four years:—

Price per lb. of Cream Laid 13 × 16 × 6 lbs.

Date.	Calcutta.	Allahabad.	Madras.	Lahore.	Delhi.
	A. P.	A. P.	A. P.	A. P.	A. P.
30-6-27	3 11½	4 1½	4 1	4 1½	3 10½
31-12-27	3 10	4 1½	4 1	4 1½	3 10½
30-6-28	3 9½	4 1½	4 1	4 0	3 10½
31-12-28	3 9	4 1½	4 1	4 2	3 11·7
30-6-29	3 9	4 1½	4 1	4 2	3 11·7

Price per lb. of Cream Laid $13 \times 16 \times 6$ *lbs.*—contd.

Date.	Calcutta.	Allahabad.	Madras.	Lahore.	Delhi.
	A. P.	A. P.	A. P.	A. P.	A. P.
31-12-29	3 9¼	4 0	4 1	3 10½	3 11·7
30-6-30	3 10	3 9½	4 1	3 10½	..
31-12-30	3 10	3 8	4 1	3 8½	3 7½
1-6-31.	3 10¼	3 10½	3 11¼	3 11	3 11

The reason for the low prices realised in Delhi is the fact that Delhi has for many years been a low priced market used by the mills to absorb their output of " Job paper ", or paper inferior to the quality normally produced in the mills; it was the policy of the mills to concentrate their sale of such paper in one market in order not to disturb their other markets by the introduction of inferior paper at lower prices. The fall of prices at Allahabad and Lahore in 1929 and 1930 was due to competition with the Punjab Pulp and Paper Mills while the rise of prices in Calcutta in 1930 represents a concerted effort by the three mills in Bengal to stabilise their Calcutta prices; and the rise in up-country prices in 1931 represents a similar attempt by the mills to stabilise prices up-country in the same manner as they had already done in Calcutta. Generally speaking the price at which the mills can sell in Calcutta is determined by the price at which paper of similar quality is imported and the prices up-country are based on the price obtained in Calcutta with the addition of railway freight. But there are various factors which disturb the operation of this general rule; Calcutta takes the better qualities of paper and sales up-country include a larger proportion of cheaper paper; in markets such as Delhi and Lahore competition from Bombay and Karachi has to be met; in many of the large up-country cities there are printers who offer long runs of one kind of paper, for which it is customary to quote special low rates, and business of this description naturally lowers the average of up-country prices Calcutta dealers have from time to time protested to the mills against sales up-country at lower prices than in Calcutta and their protests have no doubt been one of the factors which have influenced the mills in coming to their present agreement regarding prices. Before the agreement was made there was apparently severe competition in the matter of prices between the India Paper Pulp Company and the other mills, the India Paper Pulp Company selling at three pies a pound less than the older mills. Under the agreement the India Paper Pulp Company sell at one pie a pound less in Calcutta and one and a half pies a pound less in up-country markets. There was also serious competition with the Punjab Pulp and Paper Mills who began manufacture in 1929 and according to the evidence of the mills in Bengal immediately announced their intention of selling at 2 to 3 pies a lb. below the prices of the other mills. The rate war continued until 1930 when the Punjab Mills suspended manufacture.

30. We pass now to a consideration of the prices realised by the Indian mills for their manufactures. The approximate realised prices as calculated by the Companies are shown in the following statement:—

The prices realised by the Indian mills.

TABLE XXIII.

—	—	1925.		1926.		1927.		1928.		1929.		1930.		Percentage of variations. 1925-30.
		A.	P.	A.	P.	A.	P.	A.	P.	A.	P.	A.	P.	
Printing paper.	Titaghur Paper Mills Co.	3	4·24	3	5·43	3	5·55	3	4·34	3	5·16	3	4·23	—·002
	Bengal Paper Mill Co.	3	6·77	3	7·23	3	7·72	3	5·85	3	6	3	6·38	—·91
Writing paper.	Titaghur Paper Mills Co.	3	9·97	3	8·66	3	7·88	3	7·24	3	7·62	3	6·36	—7·85
	Bengal Paper Mill Co.	4	0·50	3	9·50	3	10·80	3	10·70	3	9·50	3	7·94	—9·4

The price of printing paper has remained practically stationary, while there has been a marked fall in the price of writing paper. Three companies have given their average prices for papers of all sorts.

TABLE XXIV.

—	1925.		1926.		1927.		1928.		1929.		1930.		Percentage of variations. 1925-30.
	A.	P.	A.	P.	A.	P.	A.	P.	A.	P.	A.	P.	
Titaghur Paper Mills Company.	3	5·22	3	5·87	3	5·35	3	5·25	3	4·24	3	3·43	—4
Bengal Paper Mill Company	3	4·63	3	4·88	3	3·86	3	2·90	3	2·95	3	1·84	—7
India Paper Pulp Company .	3	7·55	3	7·76	3	5·94	3	6·11	3	4·70	3	4·40	—7

The average prices realised in 1930 represent Rs. 460·02, Rs. 441·47 and Rs. 471·33 per ton. Any estimate of the future course of prices can be little more than guess work. It hardly seems worth while to do more than point to various factors which may influence them in one direction or the other. There is a certain amount of evidence that foreign producers are at present exporting to India at unremunerative prices; we have already seen that the present prices of wood pulp are very low; the Pulp and Paper industries are so closely allied that it is only natural that the prices of paper should have followed those of pulp. In so far as the slump is due to over-production it may be expected to correct itself by the help of such measures as the agreement among the European Pulp Associations to curtail their output; and the enormous growth in the world's demand for paper between 1920 and 1929 encourages a hope that the present interruption of the upward movement in consumption is only temporary. On the other hand it is impossible to forecast how long the present general depression in prices is likely to continue and even if production were restricted what the effect of monetary developments on the Paper industry might be.

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CHAPTER IV.

Progress in the use of Bamboo and the manufacture of Pulp from Bamboo.

Importance of exploratory work in Bamboo.

31. We have already seen that the object of the scheme of protection adopted by the Government of India and the Legislature was to assist the Paper industry by affording it an opportunity to continue the experimental and exploratory work in connection with bamboo which was then in progress. Both in the Assembly and in the Council of State it was made perfectly clear by the Government spokesmen that unless the industry made serious efforts to develop the processes of manufacturing bamboo paper, the Government would be at liberty to ask the Legislature to repeal the Protection Act. Sir Charles Innes, in moving in the Assembly the Resolution recommending the grant of protection, said—" I must make it plain that if after a reasonable period of time we find that no effort has been made to try out the processes, then we shall again have to come before the House and we shall have to consider with the House whether or not we should repeal the Bill ". And in the Council of State, Mr. (now Sir David) Chadwick on the introduction of the Bill said—" But in making this recommendation the Government add very distinctly one reservation, and that is this, that if none of these interests make serious attempts to develop the processes in which they are interested and which they own, within a reasonable time, then the Government will be free to come back to the Legislature and propose that this measure of protection should be withdrawn ". In considering the claim for the continuance of protection we have clearly to attach the greatest importance to the progress which the Paper industry has made with bamboo during the period of protection. The extent to which the mills have used bamboo as a raw material has already been shown in Chapter II. In this Chapter we shall discuss the work done on bamboo as a paper making material during the period of protection, the survey of supplies, the exploitation of the surveyed areas, the various processes of manufacture of bamboo pulp, the quality of the paper made and finally schemes for future development.

Supplies :
(a) Assam and Chittagong.

32. In 1924-25 the Tariff Board found that the supplies of bamboo, in the areas where the other conditions were favourable to exploitation, were very large, sufficient indeed to meet the needs of all the paper mills in India and to leave a surplus from which an export trade in pulp would eventually develop. This conclusion was reached after considering the results of surveys of the five sites which had been selected by Mr. Pearson and Mr. Raitt of the Forest Research Institute as offering the best

opportunities for immediate exploitation, *viz.*, Chittagong and Cuttack and, in Burma, Arakan, Tenasserim and the Pegu River. At that time the India Paper Pulp Company had a lease of the Kasalong Reserve in the Chittagong Hill Tracts from which they were extracting about 3,000 tons of bamboo a year. The Company now inform us that they abandoned the direct working of this concession in 1925 finding it more economical to obtain their supplies from contractors in Assam as well as in Chittagong. The Company have had a careful estimate made of the available supplies of bamboo in the Sylhet and Cachar Districts of Assam and the Chittagong Hill Tracts. This area is penetrated by ten or twelve main rivers with numerous tributaries, most of which permit of rafting bamboos from distances ranging from 20 to 50 miles and in some cases even greater distances in the forests. If exploitation is restricted to a depth of half a mile on each side of a river and to a length of 10 miles, each river should supply 1,900 tons of dry bamboo a year at the rate of 100 stems an acre cut on a six year rotation. Labour may be a difficulty: but 500 men working for six months should be able to extract 2,000 tons of bamboo and no difficulty is anticipated in securing this amount of labour in most of the areas concerned. The Company are therefore confident that they can, if necessary, obtain from these areas all the 15,000 tons of bamboo they will need annually when the capacity of their pulp plant is increased. The species of bamboo commonest in these areas is the *melocanna bambusoides* (*muli*).

(*b*) The Lower Mahanadi Basin.

33. The bamboo forests of the Lower Mahanadi basin were surveyed in 1922 by Mr. J. W. Nicholson with special reference to the possibility of utilising the bamboo in a paper pulp mill at Cuttack. The survey was limited to the forests of the Angul District and of adjacent Feudatory States. The two most prevalent species of bamboo are *dendrocalamus strictus* (*salia*) and *bambusa arundinacea* (*daba*), of which the first is the better material for pulp manufacture since its fibre is easier of extraction and it flowers sporadically and not gregariously. On a consideration of the distribution of the bamboo, of the means of communication and the supply of labour and transport, Mr. Nicholson came to the conclusion that the whole area surveyed should yield 67,600 tons of *salia* bamboo and 11,900 tons of *daba* annually and that it should be possible to deliver the bamboo at a mill at Cuttack at a cost of not more than Rs. 15 a ton exclusive of royalty. If certain other unsurveyed areas were also exploited the available annual supply should be not less than 100,000 tons. In 1928 the Titaghur Paper Mills Company took a lease for a term of 30 years of part of the Angul area which Mr. Nicholson estimated should produce 23,000 tons of bamboo a year. The Company extracted about 8,000 tons in 1930-31 and anticipate a further supply of 7,000 tons in the current season. As anticipated by Mr. Nicholson, the chief difficulty has been transport and it has been necessary to employ a fleet of motor lorries to supplement the local carts. The average lead from the point of extraction

to the river is 12 to 14 miles; and down the river to Cuttack the bamboos are floated about 90 miles. The Company—working the forest on a four year rotation instead of the seven year rotation contemplated by Mr. Nicholson and finding that on the average 330 or 340 culms yield a ton of air dry bamboo and not the 450 on which Mr. Nicholson based his calculation—expect to obtain an annual output of 25,000 tons without difficulty.

(c) Burma.

34. The bamboo areas in Burma were extensively surveyed by Mr. Raitt, who published a report on them in 1929. Meanwhile licences had been granted for the extraction of bamboo from the Lemo area in the Arakan Division and from the Tavoy area. The British Development Trust have acquired the rights over the Arakan area and have spent a considerable sum on preliminary operations. We are informed by the Government of Burma that further work has been held up by the financial and industrial depression. An extension of two years time has been offered to the Trust and it is expected that as soon as conditions improve the bamboo pulp indurtry will be developed on a large scale. Exactly the same conditions apply to the Tavoy area, the rights over which have been acquired by Messrs. Rowland Ady and Company.

(d) Other areas.

35. Additional areas have been brought under survey since 1924-25. A partial survey has been made of the Papanasam Forests in the Tinnevelly District of Madras where " the project of establishing paper manufacture at Papanasam with *ochlandra brandisii* (the Etareed) as the raw material was as sound and attractive as any in India or Burma ". The development of the scheme will, however, depend upon the construction of a hydro-electric project by the Government of Madras. In the Western and Southern Forest Divisions of North Kanara in Bombay the seeding of the bamboo (*bambusa arundinacea*) was completed only in 1923: as this species takes 13 to 14 years to recover its full culm and clump size, the new crop is not yet fit for exploitation, but it was evident that the new crop fully covered the ground occupied by the old one and that it would eventually equal or surpass it. The Madras Government have had a survey made of the Rekapalle Forest on the Godavari—about 45 miles above Rajahmundry—in order to ascertain whether it contained supplies of bamboo sufficient to meet the needs of the paper mill at Rajahmundry. The average quantity extracted from this forest for the years 1914-26 was 4,00,000 bamboos a year. The forest was divided into 13 blocks, 10 of which could yield 104,786 tons a year; on a five year rotation these 10 blocks would give 20,957 tons a year. Labour was available and transport and the cost was estimated at Rs. 15-8 a ton if worked directly by the mill or Rs. 17 if contractors were employed. The Andhra Paper Mills Company have obtained some bamboo from this forest but can get it cheaper from Gokavaram which involves cartage of only 15 to 20 miles.

Total estimated yield.

36. The annual sustained yield of such of these areas as have been subjected to a regular survey by the Forest Department is estimated as follows:—

TABLE XXV.

Area.	Estimated annual yield in tons.
I. Burma—	
(*a*) Arakan	700,000
(*b*) Tenasserim	307,000
(*c*) Tavoy and Mergui	654,000
II. Angul and Feudatory States of the Lower Mahanadi Basin	100,000
III. Papanasam (part)	25,000
IV. North Kanara	145,700
V. Rekapalle Forest of Upper Godavari	21,000
Total	1,952,700

The present output of all the Indian mills is about 40,000 tons of paper. If we assume that 2½ tons of air dry bamboo are required to make a ton of paper, the quantity of bamboo needed to produce the whole of the 40,000 tons of paper now made in the Indian mills would only be 100,000 tons. It is evident that the supplies of bamboo are sufficient not only to meet the demands of the mills but also to develop an export trade in pulp.

Air dry and bone dry.

37. Before discussing the cost of extraction it is necessary to explain that costs of raw bamboo may be stated in terms of either bone dry or air dry bamboo. Mr. Raitt in his book on the Digestion of Grasses and Bamboo writes—

> " The materials we are concerned with, in their normal air dry condition during normal states of the atmosphere, carry as part of their contents moisture which remains under normal conditions with but little variation in the neighbourhood of 10 per cent., *i.e.*, 90 of absolutely dry substance and 10 of water. But under the influence of prolonged periods of atmospheric variation from normal, this will vary considerably both up and down."—(Paragraph 24, page 24.)

And dealing more particularly with the moisture content of bamboo he writes in paragraph 107, page 96:—

> " Dry bamboo differs considerably from other materials in its capacity for retaining hygroscopic moisture, owing to the large interior surface which the sap vessels expose to changes in the humidity of the atmosphere, which in the climatic conditions of India are greater than in temperate latitudes. We have tested samples after a prolonged period of dry weather to contain only 4·75 per cent. A few days later, one

day of showery weather having intervened, it held 9 per cent., and when the monsoon was well established, 12 per cent.; and we have seen cases of 15 per cent. without the substance being noticeably damp to touch or in appearance. It is therefore necessary when making yield tests to ascertain moisture, and regulate treatment and yield to a recognised standard of air-dryness. This is generally done in laboratory work, but frequently overlooked in the mill, and may partly account for the contradictory yields hitherto reported. A 10 per cent. difference in moisture contents would be responsible for 4 to 5 per cent. difference in yield, and also vitiate the figures for chemical consumption. The English air-dry standard (N. A. D.) appears to be a fair mean throughout the year and we have adopted it for both raw material and product."

The India Paper Pulp Company who have had considerable experience of handling raw bamboo find that "air dry bamboo (well dried in the sun for 10 to 14 days) contains between 14 and 20 per cent., of moisture". In buying their supplies of raw bamboo the mills generally submit samples to a test for moisture and buy on an air dry basis, paying for the full weight including 10 per cent. moisture, but excluding moisture in excess of 10 per cent. The India Paper Pulp Company give their costs of raw bamboo on a bone dry basis, the Titaghur Paper Mills Company adopt an air dry basis and the Bengal Paper Mill Company quote prices on both bases. To effect a fair comparison of prices we have converted all bone dry prices to air dry by deducting one-tenth from the bone dry price. As regards pulp (both grass and bamboo) all the mills work out their costs on a bone dry basis; and the general practice is to deduct one-tenth from the bone dry costs in order to arrive at the air dry cost. The one exception to this rule is made by the Titaghur Paper Mills Company who, though they follow the usual practice in giving their costs for 1930-31, in working out their air dry costs for 1924-25 deduct one-eleventh from the bone dry costs. The 10 per cent. allowance for moisture adopted in the trade is in any case an arbitrary approximation and slight variations in the method of calculation will not affect the validity of the conclusions; but for the sake of uniformity we have in Table XXX worked out the Titaghur Paper Mills Company's air dry costs for 1924-25 by the method adopted in all the other cases.

Cost of extraction.

38. In 1924-25 the India Paper Pulp Company was the only firm using bamboo regularly and the quantity they used that year cost them on an average Rs. 54·72 per ton at their mill. The Tariff Board expected the cost to fall to a figure not below Rs. 40 a ton. There has actually been a reduction of the cost below this figure. The bamboo which the India Paper Pulp Company bought in 1929-30 and 1930-31 cost them on the average a fraction above Rs. 44 per ton bone dry or (allowing for 10 per cent. moisture) Rs. 39-10 a ton air dry; in 1930-31 the supply they got from Assam cost about Rs. 2 a ton less, while they have obtained trial supplies from Bihar

and Orissa at Rs. 29 a ton bone dry or Rs. 26-2 air dry, and they have also bought locally at Rs. 22-8 bone dry or Rs. 20-4 air dry. The Titaghur Paper Mills Company in 1930-31 extracted 8,000 tons from their Angul forest in Bihar and Orissa at an average cost of Rs. 38 a ton air dry delivered at their mill. They have also bought supplies from local dealers at an average price of Rs. 22 a ton air dry. They expect to get the cost of bamboo from Angul down to Rs. 30. The Bengal Paper Mill Company have obtained small quantities at Rs. 32 to Rs. 34 a ton air dry from their concession near Sambalpur in Bihar and Orissa; they have also been offered supplies by contractors at Rs. 27 a ton bone dry (Rs. 24-5 air dry). The Andhra Paper Mills Company at Rajahmundry expect, on the advice of the Forest Officer who investigated the area, to get supplies from Rekapalle at Rs. 15-8 to Rs. 17 a ton air dry and they have actually bought the small quantity used in 1930-31 at prices ranging from Rs. 20 to Rs. 27 a ton air dry. The Titaghur Paper Mills Company base their estimates for a pulp mill at Cuttack on bamboo delivered at Rs. 17 a ton air dry.

Species of bamboo treated.

39. Six species of bamboo have been treated experimentally at the Forest Research Institute, and the suitability of these six species for the manufacture of paper has been established. The species selected for treatment have been those of which supplies are known to be abundant and easily accessible and for which cheap water transport to a suitable manufacturing site is available. The distribution of each of these species is as follows:—

Bambusa arundinacea (kyakatwa daba).	Chiefly South West and Central India, also found in Burma.
Bambusa polymorpha (kyathaungwa)	Sylhet and Burma.
Cephalostachyum pergracile (tinwa)	Burma, Singbhum, Naga Hills.
Melocanna bambusoides (muli) .	Arakan and Assam.
Dendrocalamus strictus (salia) .	Throughout India and Burma.
Ochlandra brandisii (Eta) . . .	Travancore, Cochin and Tinnevelly.

The possibilities of manufacturing paper from bamboo were investigated at the instance of the Government of Burma between 1900 and 1904 and in 1902 Mr. Raitt began his prolonged study of the subject. He attributes the origin of his success to his perception that bamboo was a grass and not a wood and that its chemical composition was quite different from that of wood. The chemical composition of grass is made up of four groups of substances—

Group I.—Starch and its products.

Group II.—Pectins in several forms.

Group III.—Lignins in several forms.

Group IV.—Cellulose.

The process of digestion is the isolation of the fourth group which constitutes the fibre used in the manufacture of paper. The chief difficulty encountered in the early days of experiment was that in the process of digestion the fibre became so badly discoloured that the cost of bleaching became unduly high and both digestion and bleaching had to be so drastic as to cause considerable loss both of quality and character of the fibre. Since the manufacture of bamboo pulp has been attempted on a commercial scale another serious difficulty has manifested itself in the mechanical treatment of the bamboo preliminary to digestion. This mechanical treatment is necessary in order to disintegrate the fibre and render it accessible to the chemical reagent employed in the process of digestion.

Variations in mechanical treatment.

40. In the early experiments the mistake was made of treating bamboo as a wood, and insufficient attention was devoted to those physical features in which it is markedly dissimilar from wood, *e.g.*, the facts that it is porous, that it is resistant to mechanical force in a transverse direction only, and the existence of nodes. Mr. Raitt perceived that the correct treatment was to crush—not to chip—bamboo; but the simple methods of crushing which were found effective under the laboratory or semi-commercial conditions at Dehra Dun were obviously not applicable to mill conditions. That he was unduly optimistic in announcing that "the mechanical problems presented by the bamboo culm have ceased to exist" is proved by the variety of the methods now employed by the mills, as also by the fact that at Dehra Dun itself experiments are still being made with the mechanical treatment of bamboo, the latest machine employed being a bone disintegrator.

(a) The India Paper Pulp Company.

41. The India Paper Pulp Company in 1924 told the Tariff Board that their crushing plant was imperfect in that it dealt less adequately with some kinds of bamboo than with others. Their plant now consists of five pairs of rolls each with different surface characteristics and a cutter which cuts the bamboo to two-inch pieces. The capacity of this crusher is approximately 24 tons of raw bamboo a day. The Company first tried to secure improved results by altering the nature of the surface of the rolls and fitted special hard steel sleeves for this purpose. These effected some improvement, but not so much as had been anticipated. The next attempt was with splintering machines; first one and subsequently two machines were set up in series, the bamboo being treated by both machines after having been crushed and cut in the crusher and before going to the duster. The results so obtained were distinctly better than before; but there is still too much unevenness in the size of the pieces; the cook has to be adjusted to suit the bigger pieces with the result that the treatment is too strong for the smaller pieces. To remedy these defects the Company have made a series of experiments with three fibre separating machines each with a capacity of about 6 tons of raw bamboo a day, which have been installed successively since November 1930. The results produced by these machines which apply a more even pressure have been far better than anything previously obtained, especially when the bamboo is soaked before it is put through the machine. They have effected a marked reduction in cooking time combined with a

reduction in acid consumption without any sacrifice of the quality of the pulp.

(b) The Titaghur Paper Mills.

42. The Titaghur Paper Mills Company first used heavy chippers of the type usually employed for wood with special appliances intended to ensure a more effective treatment of bamboo. The Company found them satisfactory up to a point, but regard them as only fit to be employed as supplementary to or as a stand-by to a crushing plant. Experience with them led to the installation of a very heavy type of crusher with at first three and subsequently four sets of rolls of different surface characteristics. After being crushed the bamboo is chipped in pieces of about an inch in length; it is not dusted. The capacity of the plant is 24 tons of bamboo a day. This crusher is not altogether satisfactory and the Company have plans ready for an improved one, but before placing the order for it they are waiting to see how the new crusher just installed at Raniganj comes up to requirements.

(c) The Bengal Paper Mill.

43. It is only recently that the Bengal Paper Mill Company have had anything more than a lightly designed experimental crusher, with which they have had great difficulty in treating the material properly and especially in the complete disintegration of the nodes. Their new crusher has three pairs of rolls with different surface characteristics; the first pair breaks the bamboo into pieces about 2½ to 3 inches long; these pieces fall by gravity to the second pair of rolls which are below the first pair and from the second to the third pair they are led by a small mechanical conveyor. The crusher is designed to open the fibres out and represents an attempt to combine crushing, cutting and splintering in one process. It is guaranteed to crush 10 tons in 8 hours and when it is really working to capacity it is expected to deal with 25 tons a day. The bamboo is not dusted or cleaned but is passed straight from the crusher into the digester.

(d) The Andhra Paper Mills.

44. At Rajahmundry the crusher has two pairs of rolls—the first pair grooved horizontally and the second fluted. It was bought in 1920 specially for use on bamboo; but it crushes the bamboo unevenly, is entirely ineffective and is not now used. The crusher is intended to feed the bamboo automatically to a chipper, but if so fed the bamboo does not offer effective resistance to the chipper. So at present the crusher is discarded and the bamboo is fed by hand direct to the chipper. The chips are then screened and sent to the chip bin where they are stored until wanted for the digester. The chipper is said to be able to deal with 12 tons of bamboo a day in 2 shifts of 8 hours each.

(e) Various processes summarised.

45. The present position as regards the mechanical treatment of bamboo may be summarised thus: the Forest Research Institute is experimenting with a bone disintegrator: at Naihati the bamboo is crushed and cut and splintered and dusted, but experiments with

new fibre separating machines are giving more satisfactory results: at Kankinara the bamboo is crushed and chipped, but not dusted; they are not satisfied with their machine and have plans ready for an improved one: at Raniganj a new crusher has just been installed which crushes and cuts and opens out the fibre; it has not yet been tried out under mill conditions: at Rajahmundry the crusher is ineffective, the bamboo is only chipped and screened. It is perfectly clear that although the mechanical treatment of bamboo has made very considerable progress further experimental work is necessary.

Chemical treatment of bamboo: (*a*) Sulphite or acid process.

46. The next process in the treatment of bamboo is digestion, which is the chemical process by which the various substances other than cellulose are dissolved. We have already seen that these substances consist in the main of starches, pectins and lignins. To remove these substances two processes are in use: the India Paper Pulp Company use an acid process similar to that employed on coniferous wood; it was a patent process when the Board held its enquiry in 1924-25, but is now no longer so, the patent having expired nearly two years ago: the other mills use caustic soda, some with and some without an admixture of sodium sulphide. Though Mr. Raitt has expressed doubts as to the suitability of the acid process for bamboo we find that the sulphite process has been used throughout at Naihati with satisfactory results. No undue discolouration is noticed in the paper, and the quantity of bleach required is not excessive. Nor does the total cost appear high as compared with that attained at the Kankinara mill by the alkali process on the same output of bamboo pulp in 1930-31. The India Paper Pulp Company agree with Mr. Raitt that magnesia bisulphite is more satisfactory than calcium bisulphite, calcium being too acid for bamboo. The boiling is done in a digester which now holds 9 tons of dry fibre; if, as they hope, they can reduce the quantity of acid by 15 per cent. they could increase *pro tanto* the quantity of fibre treated in one digestion; they now use 14 per cent. of sulphur and 9·2 per cent of magnesite per ton of bamboo treated; and the period of boiling has—mainly by improved mechanical treatment of the bamboo—been reduced from 24 hours to an average of 13 hours at a pressure of 75 lbs. The average cooking time for the acid process in the United States of America and Canada as applied to wood appears to vary from 15 to 18 hours. Compared with this the average period of cooking at Naihati seems satisfactory. They are just constructing an experimental recovery plant by which they hope, if the plant proves successful, to save 20 to 25 per cent. of their present consumption of sulphur.

(*b*) The alkali process.

47. The alkali process is applied in a variety of ways—by the 'overhead' method in which the whole of the boiling is done at one stage, by the 'fractional' system, patented by Mr. Raitt, and by the 'cascade' system employed by the Titaghur Paper Mills Company at their Kankinara mill. The essen-

tial characteristic of the 'fractional' system is that it recognises both that starches and pectins are more easily soluble than lignins, and that it is the starches and pectins which produce the malignant dyes which discolour the pulp. Starches are soluble in water and pectins are soluble in 1 per cent. caustic soda solution; while lignins are only soluble in 4 per cent. caustic soda solution at steam pressure above 25 lbs. The starches produce during digestion a dye which stains the pulp, is not wholly washable and is not entirely discharged by a large excess of bleach. The pectins produce a malignant non-washable unbleachable and permanent dye on the pulp and when these dyeing reactions are allowed to take place, the best bleaching results only in a cream white, which is usually masked in paper making by tinting with blue and pink. Under the fractional process fresh liquor of the strength and at the pressure necessary to dissolve the lignin is applied to the fibre only after the starches and pectins have been dissolved in liquor which has already been employed to break down lignin in a previous digestion. Thus the weakest liquor is applied to the fibre at the first stage of digestion, when the more easily soluble substances are removed at low pressure; and the fresh liquor is applied only at the last stage when the lignins alone remain to be treated at high pressure. By this use of the 'counterflow' principle economy of chemicals and steam is attained, for a high pressure is applied only at the stage at which it is needed and the material finally breaks down into pulp in a liquor which is not affected by the degraded colour products of the starches and pectins. This principle was apparently known on the Continent of Europe many years ago when it was applied to wood and Mr. Raitt has adapted it to his fractional system in which, at different stages, he applies different densities of liquor at different pressures. The difference between this 'fractional' system and the 'cascade' process employed at Kankinara is that whereas under the fractional system it is claimed that certain substances are eliminated at definite stages and each stage is definitely separated off from the next, the "cascade" process is a continuous one, carried out in a battery of digesters, the counterflow principle being retained, but without the specific identification of the removal of any particular substance at any particular stage. At Kankinara the digester has a capacity of 3 tons and pure caustic soda is used; Raniganj gets its best results from 12·5 per cent. caustic soda and 6·5 per cent. sodium sulphide, the capacity of the digesters being 1½ and 2½ tons; and at Rajahmundry-about 7·2 per cent. sodium sulphide is used to 10·8 per cent. caustic soda in a digester with 6 tons capacity. Where sodium sulphide can be used it constitutes a great economy, for the price of sodium sulphide is only Rs. 60 a ton as compared with Rs. 240 a ton for caustic soda; but the smell which it creates prevents its use in populous areas, *e.g.*, at Kankinara, unless the mill is working on a scale sufficient to justify the installation of a deodorising plant. Raniganj has just begun to try the fractional system; it is also being tried at Rajahmundry. All the mills have a soda recovery plant: that at Raniganj is the most efficient securing a recovery of 78 per cent.: the Titaghur

Paper Mills Company now secure 51 per cent. as against 38 per cent. in 1924-25; while at Rajahmundry the plant is ill-designed, the evaporators are inadequate and they only succeed in recovering 20 per cent. though the incinerator is capable of better outturn.

Subsequent processes: (*a*) Washing and straining.

48. We now proceed to the subsequent stages of pulp and paper manufacture and note briefly the chief improvements made in each mill. The India Paper Pulp Company have devoted much attention to the perfection of the washing and straining processes and eventually—as none of the standard types of strainer was entirely suitable—decided to purchase a centrifugal type of separator. This however by itself was not enough; and a large strainer has also been installed as well as a new form of sand table. A new straining plant has been installed at Raniganj, suitable for dealing with bamboo.

(*b*) Bleaching.

49. The India Paper Pulp Company have reduced their consumption of bleach from 3·40 cwts. per ton of bleached paper made in 1924-25 to 2·36 cwts. in 1928-29 and 2·47 cwts. in 1929-30. There was a further reduction in 1930-31, partly due to the use of 'Perchloron' instead of ordinary bleaching powder. Perchloron is a comparatively new product containing a much higher percentage of available chlorine. Bleaching powder contains 36—37 per cent. at the time of manufacture; but there is considerable loss of strength before it is actually used. Perchloron is claimed to contain 75 per cent. available chlorine and to be more stable. Consequently a given quantity of Perchloron does the same work as a larger quantity of bleaching powder and its cost is correspondingly higher. The Titaghur Paper Mills Company manufacture their own bleach by electrolytic process at Titaghur for use in that mill and for supply to Kankinara. At Raniganj five new bleaching towers have been installed to deal with bamboo pulp. The Andhra Paper Mills Company have encountered difficulties in importing bleaching powder, finding that the strength of available chlorine falls from 35 per cent. to 15 per cent. and are now using a bleaching solution made from liquid chlorine with the addition of a small quantity of bleaching powder. They are considering the installation of an electrolytic plant for the production of bleach.

(*c*) Beating and Paper making.

50. The India Paper Pulp Company installed a second Paper Machine in 1927 with beaters of a new type which have contributed largely to the improvement of their manufactures; and as a result of the experience gained with them they have ordered a new experimental beater embodying the latest improvements. The Andhra Paper Mills Company in the year during which they have worked the mill have recognised that one of the most serious deficiencies in their plant was the inadequacy of their beater capacity to keep the paper machine supplied; this they have to some extent rectified by installing an additional beater.

Improvements in Power Plant.

51. The India Paper Pulp Company have installed a new Thompson Water Tube Boiler to provide the extra steam required for their additional paper machine. This has materially reduced their power costs: their turbine now works at two-thirds instead of one-third capacity: steam is supplied at a pressure of 220 lbs. instead of 140 lbs.: the new boiler being fitted with automatic chain grate stokers is suited to the use of slack coal; combustion is more efficient resulting in a lower coal consumption per pound of steam; the automatic stokers have reduced stoking and boiler operating costs. The Titaghur Paper Mills Company have installed two new Thompson Boilers at Kankinara as well as a 600 K. W. turbo-generator. Here too economy has resulted from the changes made —especially in the use of slack coal. The Bengal Paper Mill Company have also made extensive alterations to their Power plant; two Thompson boilers have been installed and an 1,100 K. W. steam turbine and great progress has been made in the electrification of the mill. The reduction in the consumption and cost of coal resulting from these improvements and additions to the power plant in the mills will be examined in detail in Chapter V.

Expenditure on improvements connected with bamboo.

52. It will be clear from the foregoing paragraph that all the mills have incurred considerable capital expenditure on additions and improvements to their plant. The total capital expenditure incurred by each Company since 1924-25 is given as under:—

	Rs.
Titaghur Paper Mills Company	25,66,057
Bengal Paper Mill Company	11,75,492
India Paper Pulp Company	9,48,589

The Andhra Paper Mills Company acquired the Mill at Rajahmundry for Rs. 4½ lakhs and have spent about Rs. 1½ lakhs on repairs, alterations, and experiments. The Forest Research Institute has given the Company an estimate showing that to render the mill capable of producing 10 tons of paper a day, which should make it a reasonably profitable concern, further expenditure of about Rs. 10 or Rs. 11 lakhs is necessary. The Tariff Board in 1925 anticipated that for Rs. 10 lakhs the India Paper Pulp Company would be able to instal a second paper machine and additional plant for pulp manufacture. Estimates for the complete plant required came to Rs. 13 lakhs and the Company were unable to raise more than Rs. 10 lakhs. Accordingly the paper machine alone was ordered and the extension of the pulp section was postponed. The Company have however spent about Rs. 1½ lakhs on additions to their bamboo pulp plant. Of the capital expenditure incurred by the Titaghur Paper Mills Company, Rs. 14·23 lakhs represent improvements to the pulp plant and Rs. 11·43 lakhs have been spent on paper making plant; and of the Rs. 14·23 lakhs spent on the pulp plant, Rs. 5·83 lakhs expenditure was due to the special requirements of bamboo pulp, while plant worth Rs. 2·50 lakhs bought for a mill in Burma which did not materialise has also been used in the manufacture of bamboo pulp. This Company also propose to instal new digesters and an additional crusher for the treatment of bamboo at an estimated cost of about Rs. 3½ lakhs. The Bengal Paper Mill Company have spent Rs. 4·16 lakhs on plant specially designed and installed for the treatment of bamboo pulp. Thus the capital expenditure on the development of the bamboo pulp industry during the period of protection is ascertained to be:—

	Rs. in lakhs.
Titaghur Paper Mills Company	5·83
Bengal Paper Mill Company	4·16
India Paper Pulp Company	1·50
Andhra Paper Mills Company	1·50
	12·99
Further expenditure contemplated by the Titaghur Paper Mills Company.	3·50
	16·49

Thus it will be seen that out of a total capital expenditure of about Rs. 47 lakhs nearly Rs. 13 lakhs have already been spent on the development of the bamboo pulp industry and a further expenditure of Rs. 3½ lakhs is contemplated.

Quality of paper made from bamboo.

53. The general improvement which has taken place in the quality of paper made by Indian mills is discussed in Chapter V. Trade opinion on the quality of bamboo paper as expressed by the importers and traders in their evidence has been somewhat vague. This is probably due to the fact that only small quantities of paper made entirely or mainly from bamboo have hitherto been placed on the market and the trade therefore has not had sufficient opportunities of judging it. It may however be mentioned that the mills which have done most work on bamboo—Naihati and **Kankinara**—are enthusiastic about its potentialities and they have furnished extracts from the opinions of their Managers testifying to the qualities of bamboo paper and its suitability for market requirements. There is also the testimony of the Forest Research Institute as to the quality of bamboo paper. At our request the Officer in charge of the Paper Pulp Section of the Institute has carried out a test of the comparative strength of paper made from *sabai* grass and paper made from bamboo. His complete note is reproduced in Appendix III. The general result of the test is that while bamboo pulp requires 25 per cent. more beating than grass pulp to produce paper of comparable quality, the bamboo paper is actually stronger than the grass paper. The Institute report that during the last six years the possibilities of manufacturing various kinds of paper from bamboo have been fully tested both on semi-commercial and commercial scales; also that "bamboo has been accepted by the

trade as an excellent material for the production of a wide range of papers". They also quote the opinion of the Manager of the Government Press that "the paper used for printing the Annual Report on Forest Research Work in India for 1927-28" (which consisted of 100 per cent. bamboo furnish) "was in every way satisfactory and gave no trouble whatsoever". The Institute further had samples of bamboo pulp examined by Messrs. The Havero Trading Company, Limited; their principals in Germany, who represent a very important group of chemical manufacturers, reported, after carrying out tests, that the "bleached bamboo pulp was of excellent quality and is regarded as a perfect substitute for bleached sulphite cellulose"; also that "bamboo pulp represents a material at least equally good to sulphite cellulose in dyeing and in paper making".

Future developments.

54. The conclusion to which we are led by a consideration of the circumstances narrated in this Chapter is that considerable progress has been made in the improvement and development of bamboo pulp. Though progress has not been so immediate or so rapid as was anticipated six years ago, we believe that firm and solid foundations have been laid for the industry. The confidence of the industry in the future of bamboo is shown by the arrangements now being made for further development. Both the Titaghur Paper Mills Company and the India Paper Pulp Company have planned to increase the pulp capacity of their mills to something nearer the capacity of their paper machines than it is at present; at Naihati the intention is to use annually 15,000 tons of raw bamboo instead of 4,436 tons used in 1930-31, and to increase the tonnage of pulp manufactured from 1,965 tons to approximately 6,000 tons a year. Similarly at Kankinara work is actually being carried out which will increase the pulp capacity of the mill from 4,000 to 7,000 tons a year. The Bengal Paper Mill Company are just completing arrangements for the manufacture of 600 tons of bamboo pulp a month at the mill at Raniganj, and if adequate financial backing were forthcoming it is probable that a similar development might take place at Rajahmundry. But besides these developments at the mills which are already at work, there are much larger schemes in preparation. The Titaghur Paper Mills Company have nearly completed their plans for a mill at Cuttack calculated to produce 10,000 tons of pulp a year. The British Development Trust, who hold the license to extract bamboo from part of the Arakan Division of Burma, contemplate the construction of a mill equipped for the production of 40,000 tons of pulp a year. The supplies of bamboo reported to be available in the Tavoy area are only very little less than the supplies in Arakan; and we have been informed by the Government of Burma that the firm which holds the license for extracting bamboo in this area, Messrs. Rowland Ady and Company, have spent a considerable amount of money on acquiring the concession and on preliminary enquiries; it is at least possible that a second 40,000 ton pulp mill may before long be started in Burma. Another contemplated development which has been brought to our notice

is a proposal to establish a pulp and paper mill in the Adilabad District of His Exalted Highness the Nizam's Dominions. Preliminary investigations have not yet been completed. His Exalted Highness the Nizam's Government are considering the question of submitting the scheme to expert scrutiny and it must therefore be looked upon as still immature, but it has been placed before us in sufficient detail to give us some indication of its prospects. The proposal is to construct a mill capable of making 5,000 tons of paper a year. Within 14 miles of the site selected for the mill are blocks of bamboo forest which have been surveyed in considerable detail. It is estimated that these blocks worked on a 3-year rotation will give an annual yield of about 25,000 tons of green bamboo, which should be quite enough to assure the mill an annual supply of 12,500 tons, even if a 3-year rotation proves to be too short. The cost of extraction and transport to the mill is estimated at about Rs. 16 a ton or Rs. 23 including royalty as proposed by the Forest Department. This price compares not unfavourably with the prices at which other mills are getting their supplies. No difficulty is anticipated in obtaining adequate supplies of good water. Coal will be obtained either from the Singareni Collieries Company's Bellampalli Mines or from the Bellarshah Collieries in the Central Provinces, both of which are within easy reach; at present prices and freight rates the price of coal at the mill site would be Rs. 6-6 or Rs. 7-4 a ton. Both in the availability of adequate supplies of bamboo and in the proximity of coalfields the scheme starts with great advantages; and there is every reason to expect that when it is completed, provided sufficient inducement is offered to financial interests, it will show a reasonable prospect of success. These signs of growing confidence in the future of bamboo pulp strengthen our conviction that the result of the work of the last six years has been the establishment of the industry on firm foundations.

CHAPTER V.

The Costs of Production in 1924-25 and in 1930-31.

Examination of costs confined to three mills.

55. In 1925 the Board confined the examination of the cost of production to the figures submitted by the Titaghur Paper Mills Company, the India Paper Pulp Company and the Bengal Paper Mill Company. The works costs of the Upper India Couper Paper Mills Company at Lucknow were too high to be typical; and the Deccan Paper Mills Company had not supplied any cost figures more recent than 1913-14. On this occasion we shall again confine our examination to the evidence tendered by the same three companies who produce nearly 35,000 tons out of the 40,000 tons of paper manufactured in the country and who are the principal companies which have attempted to develop the bamboo pulp industry. The costs at the Lucknow Mills are still much higher than at the other grass mills; the Deccan Paper Mills Company have in this enquiry supplied cost figures for the past six years, but the indigenous materials which are used in their mills are waste paper and rags, and the cost of manufacturing paper from these materials is hardly relevant to an enquiry into the development of the bamboo pulp industry. The Andhra Paper Mills Company at Rajahmundry have been working their mill on a small and uneconomical scale for a little more than a year and they have been unable to supply us with information regarding their costs.

Reduction in costs affected by use of imported wood pulp.

56. We have already shown that each of the three Bengal companies has succeeded since 1924-25 in effecting a very considerable reduction in their works costs. The following statement compares the costs in 1924-25 with those of 1930-31. The costs are average costs for all kinds of paper:—

TABLE XXVI.

 1	Costs *ex* mill in 1924-25. 2	Costs *ex* mill in 1930-31. 3	Percentage of difference between cols. 2 and 3. 4
Titaghur Paper Mills Company . .	431·06	360·07	16·5
Bengal Paper Mill Company . .	463·84	350·83	24·4
India Paper Pulp Company . .	458·63	330·65	27·9

Before proceeding to a detailed examination of these figures we must observe that this substantial reduction in costs is due not only to a fall in the prices of materials and coal and to greater efficiency of working but also to the use of imported wood pulp. All the Companies have used larger quantities of this pulp:—

TABLE XXVII.

	Quantity of wood pulp used.		Quantity of finished paper represented by tonnage of wood pulp.		Proportion of total output of finished paper represented by tonnage of wood pulp.	
	1924-25 Tons.	1930-31 Tons.	1924-25 Tons.	1930-31 Tons.	1924-25 per cent.	1930-31 per cent.
Titaghur Paper Mills Company.	6,725	10,026	5,716	8.522	36·7	44·2
Bengal Paper Mill Company	2,028	5,573	1,725	4,801	27·2	52·1
India Paper Pulp Company .	622	4,536	535	3,901	21·0	63·0

In this period the average price of imported pulp as has been shown in Chapter II has fallen by 18½ per cent. It is evident that the increased use and the fall in the price of wood pulp must vitiate any comparison of the works costs of finished paper as between 1924-25 and 1930-31. In order to eliminate as far as possible the influence on costs of the use of wood pulp, it is necessary to consider separately the cost of manufacturing pulp and the cost of converting pulp into paper. The effect of the increased use of wood pulp in extending the output of paper and consequently reducing the cost of converting pulp into paper will still remain. This is a factor however which will be useful in indicating the extent to which production on full capacity in the paper section of the mills has enabled them to reduce costs. We also propose to indicate in the course of the discussion how far any reduction in cost is merely due to the fall in the price of coal and other materials and how far there has been general improvement in the efficiency of the mills.

Difficulty of comparing costs of different mills.

57. But before beginning to examine these figures in detail we wish to emphasise the fact that the object of this comparison is to ascertain the improvement in the efficiency of the working of the mills, and not to compare the costs of one mill with those of another. It is indeed impossible to institute any useful com-

parison between one mill and another for a variety of reasons. In the first place there is a great difference in the proportion in which the primary materials are used. In 1930-31 the proportion of paper made by each Company representing each of the primary materials used was as follows:—

TABLE XXVIII.

	Titaghur Paper Mills Co.	Bengal Paper Mill Co.	India Paper Pulp Co.
Grass	28·5	31·6	—
Bamboo	9·6	·2	30·3
Other indigenous fibres .	8·7	8·8	2·4
Imported pulp	44·2	52·1	63·0
Total .	91·0	92·7	95·7

The balance is the proportion which represents loading and sizing materials. In the second place, there is great variation in the costs of these materials. For example, in 1930-31 the average cost of grass to the Titaghur Paper Mills Company was Rs. 49-6-3 a ton and in 1930 the Bengal Paper Mill Company paid an average price of Rs. 52-12. The cost of bamboo in 1930-31 to the Titaghur Paper Mills Company was Rs. 38 a ton air dry for supplies from Angul or Rs. 22 a ton air dry for local supplies, while the India Paper Pulp Company paid a fraction less than Rs. 44 a ton bone dry or Rs. 39-10 air dry for their supplies for the years 1929-30 and 1930-31, and the Bengal Paper Mill Company got their small quantity at a cost of Rs. 32 to Rs. 34 a ton air dry from their own concessions or Rs. 24-5 air dry delivered at the mill by contractors. These figures represent largely differences in local conditions which render useful comparison between the mills difficult. Moreover, each mill has its own peculiar processes of manufacture. In our Chapter on the development of bamboo as a paper making material we have described the different methods of mechanical treatment and digestion adopted in the manufacture of bamboo pulp. And as regards the grass mills, any comparison between the Bengal Paper Mill Company's mill at Raniganj and the Titaghur Paper Mills Company's No. 1 mill is vitiated by the fact that whereas the Bengal Paper Mill Company import all their caustic soda and bleaching powder, the Titaghur Paper Mills Company have at their No. 1 mill an electrolytic plant which produces all the bleach they use at both their mills and all the soda they use at Titaghur. Again, there is a marked difference in the classes and qualities of paper manufactured by the three companies, as illustrated in the following statement:—

TABLE XXIX.

Classes of paper.	Proportion of total tonnage manufactured by		
	Titaghur Paper Mills Co.	Bengal Paper Mill Co.	India Paper Pulp Co.
Cream Laids and Woves	21·80	11·34	41·76
White Printings	42·08	39·83	45·35
Unbleached and Badami	22·37	21·26	7·89
Wrappers	—	18·13	2·58
Others	13·75	9·44	2·42

N.B.—The figures for the Titaghur Paper Mills Company are the actual proportions for the year 1930-31; for the India Paper Pulp Company they are the proportions of the total output for the years 1924-25 to 1930-31; and for the Bengal Paper Mill Company they are the average percentages for the years 1928, 1929 and 1930.

We are informed by the Bengal Paper Mill Company that the term 'Unbleached' or "Semi-bleached" as applied to paper manufactured to the order of Government is really a misnomer, for the paper is first fully bleached and then coloured to the shade required. The India Paper Pulp Company state that for semi-bleached paper they use only 33 per cent. of the bleach which they use on white printings. In a mill like that at Raniganj, where a considerable proportion of the output is represented by wrappers, it is possible to use the waste and dirty material which would otherwise have to be thrown away. And it is clear that the quality and class of the paper manufactured must affect the consumption of bleach and China clay and also the consumption of power in beating and calendering; we find, for example, that the India Paper Pulp Company use on the average 2·47 cwts. of bleach per ton of finished paper, while the average consumption of bleach by the Bengal Paper Mill Company is only 2·06 cwts.; and the average consumption of China clay is 1·64 cwt. per ton at Naihati as against 2·58 cwts. of Indian China clay at Raniganj. It is clear therefore that no useful comparison can be made between the works costs of the different companies.

Separation of pulp costs and paper costs.

58. In our examination of the cost statements of the three Companies we notice first that the separation of the cost of the manufacture of pulp from the cost of converting pulp into paper has involved the allocation of certain charges. At the Titaghur and Raniganj Mills all costs are charged directly, except "on cost charges" which represent a share of the management and other overheads and it is only these "on cost charges", which constitute less than 2 per cent. of the total costs, that have to be allocated between pulp and paper; but at Naihati all charges

except the cost of materials have been allocated. We have examined the manner in which the allocation of the costs of coal, labour, stores, supervision and miscellaneous charges have been made and are satisfied that it may be accepted as a fair representation of the actual costs. 455 tons of coal out of an average monthly consumption of 1,282 tons are taken as used on pulp preparation of which 93 tons are allocated to power and 362 tons to cooking; the cost of boiler coolies is distributed in the same proportion. In 1924-25 all the wages charged to bamboo crusher, acid plant, digesters and blow pit and washing plant were chargeable to pulp; in 1930-31 half the charges for the washing plant are debited to paper having regard to the proportion of imported pulp used. The charges for carrying coolies are distributed equally between pulp and paper. The cost of stores is distributed in the same manner as the labour charges. Supervision charges in 1924-25 were distributed equally between pulp and paper; in 1930-31 one-third of the Manager's salary and one-fifth of the Engineer's is charged to pulp; of the miscellaneous charges one-third in 1924-25 and one-fifth in 1930-31 are charged to pulp, the difference in the proportion being due to the installation of a second paper machine. The method of allocation being more or less the same in both years the costs may be regarded as comparable.

Costs of pulp manufacture.

59. The India Paper Pulp Company have given us their costs for the manufacture of bamboo pulp in 1924-25 and 1930-31. No bamboo pulp was made by the other Companies in 1924-25 and in their case we examine only the cost of the manufacture of grass pulp. The India Paper Pulp Company's figures are:—

TABLE XXX.

	Works cost of manufacture of one ton of dry bamboo pulp in 1924-25.	1930-31.
	Rs.	Rs.
Bamboo	124·38	100
Sulphur	26·96	31·01
Magnesite	24·84	23·25
Coal	26·97	17·37
Wages	23·62	23·54
Stores	11·93	14·18
Supervision	7·22	4·30
Miscellaneous	6·82	4·85
Total	252·74	218·50
or for commercial air dry pulp containing 10 per cent. moisture	227·47	196·65

The Titaghur Paper Mills Company's figures are:—

	Works cost of manufacture of one ton of dry grass pulp in	
	1924-25.	1930-31.
	Rs.	Rs.
Grass	146·25	127·10
Chemicals	33·51	28·44
Labour	18·89	13·99
Steam and Power	29·77	20·33
Other conversion charges . .	7·38	12·13
On cost charges	2·57	2·27
Total .	238·37	204·26
or for commercial air dry pulp containing 10 per cent. moisture .	214·53*	183·84

The Bengal Paper Mill Company have given their costs in a different form and for bleached pulp. Since bleaching is more usually treated as an item in the process of paper manufacture (and as the Bengal Paper Mill Company have given us their costs of converting *unbleached* pulp into paper) we have excluded from their statement of the cost of pulp the cost of bleaching powder. We have not been able to separate the cost of steam or electric power used in bleaching; but this figure, being only a fraction of Rs. 4·475 (the total cost per ton of electrical and steam power used for boiling, bleaching and straining), is negligible and its inclusion in the cost of pulp manufacture cannot materially affect the figures.

TABLE XXXI.

	Works cost per ton of pulp made from grass in	
	1924.	1930.
	Rs.	Rs.
Cost of one ton of grass	63·89	52·73
Cost of boiling—		
Chemicals	37·61	17·53
Labour	5·19	5·11
Steam	4·13	1·51
Establishment costs	2·06	2·80
Total .	112·88	79·68
At yield of 40 per cent. in 1924 and 46 per cent. in 1930 the cost of preparing a ton of grass pulp bone dry is	282·21	173·22
Add cost of electrical and steam power	3·26	1·19
Total .	285·47	174·41
or for air dry pulp with 10 per cent. moisture	256·93	156·97

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* For reasons given in Chapter IV para. 37, this figure is substituted for the figure Rs. 216·70 given by the Titaghur Paper Mills Company.

The reduction in the case of Naihati is 13·5 per cent., in the case of Titaghur 14·3 per cent. and in the case of Raniganj 38·9 per cent.

Cost of converting pulp into paper.

60. An examination of the works costs of converting pulp into paper brings to light variations in the methods by which the mills have prepared their statements. The India Paper Pulp Company take into account as part of the cost of conversion the value of the fibre lost in bleaching and on the paper machine. The other mills do not include this loss as part of the cost of conversion. We think that the loss of fibre at the different stages of manufacture will more appropriately be discussed when we come to consider the yield of finished paper which the mills obtain from their fibres. The Bengal Paper Mill Company include in the cost of conversion from pulp to paper the value of the China clay used as loading, as indeed is necessary if the cost is to be stated per ton of finished paper. We are of the opinion that this method is misleading for the purpose of estimating costs; China clay adds to the weight of the finished paper and so reduces its cost per ton; and we think it more correct to show the cost of converting pulp into paper which contains no loading and to state the cost per ton of unbleached pulp. We have accordingly excluded both these figures from the costs statements which follow:—

TABLE XXXII.

1. *Statement showing the cost of converting a ton of air dry unbleached pulp into finished paper by the Titaghur Paper Mills Company.*

सत्यमेव जयते

	1924-25	1930-31
	Rs.	Rs.
Cost of—		
Bleach	38·20	21·73
Other chemicals	14·87	13·62
Labour	28·31	23·46
Power and fuel	40·04	18·79
Repairs	23·60	21·43
Supervision	6·82	9·05
Packing and miscellaneous . .	16·21	21·36
Total .	168·05	129·44

2. *Statement showing the cost of making a ton of finished paper from air dry unbleached pulp by the Bengal Paper Mill Company.*

	1924-25 Rs.	1930-31 Rs.
Cost of—		
Bleach	25·77	8·99
Other chemicals	18·42	11·66
Labour	71·59	45·05
Power and fuel	54·56	13·48
Repairs	45·71	26·89
Supervision	12·10	10·12
Packing and miscellaneous . .	12·56	16·80
Total .	240·71	132·99

3. *Statement showing the cost of converting a ton of air dry unbleached pulp into finished paper by the India Paper Pulp Company.*

	1924-25 Rs.	1930-31 Rs.
Cost of—		
Bleach	28·35	14·25
Other chemicals	15·46	12·69
Labour	30·61	24·94
Power and fuel	26·82	9·40
Repairs	25·20	22·74
Supervision	15·39	7·23
Packing and miscellaneous .	29·37	20·63
Total .	171·20	111·88

सत्यमेव जयते

N.B.—The statement supplied by the India Paper Pulp Company gives the costs as Rs. 190·21 and Rs. 124·30 per ton of bone dry pulp. To show the cost per ton of air dry pulp their figures have been reduced by 10 per cent.

It will be noticed that while the Titaghur and Naihati Mills give their cost of conversion per ton of unbleached pulp, the Bengal Paper Mill Company give their cost per ton of finished paper. The cost of conversion per ton of unbleached pulp at Raniganj is estimated by the Company as Rs. 230·15 in 1924-25 and Rs. 129·02 in 1930-31. But these figures include the cost of China clay used in loading; this cost represents 6·60 per cent. of the total conversion costs in 1924-25 and 6·31 per cent. in 1930-31. Making a corresponding reduction from the costs as given by the mill, we arrive at Rs. 214·96 as the cost in 1924-25 of converting a ton of unbleached pulp into finished paper without loading and Rs. 120·88 as the corresponding cost in 1930-31.

The costs have been reduced at Naihati by 34·6 per cent., at Titaghur by 23·0 per cent. and at Raniganj by 43·8 per cent.

61. We now proceed to examine the principal factors which have contributed to this substantial reduction in the cost both of manufacturing pulp and of converting pulp into paper. The reduction is in some measure due to the fact that all three mills are now working nearly to full capacity. So far as pulp is concerned the Titaghur Paper Mills Company made about 1,100 tons more in 1930-31 than in 1924-25: but the other two Companies each made a little less.

Effect on costs of increased output of paper.

TABLE XXXIII.

	Quantity of pulp manufactured.	
	1924-25.	1930-31.
	Tons.	Tons.
Titaghur Paper Mills Co. . . .	7,635	8,751
Bengal Paper Mill Co. . . .	3,912	3,743
India Paper Pulp Co. . . .	2,035	1,965

In the case of pulp manufacture therefore increase of output can have had little or no influence on costs. But the figures of paper manufactured reveal a very different state of things:—

TABLE XXXIV.

	Quantity of paper made.	
	1924-25.	1930-31.
	Tons.	Tons.
Titaghur Paper Mills Co. . . .	15,556	19,260
Bengal Paper Mill Co. . . .	6,349	9,218
India Paper Pulp Co. . . .	2,545	6,188

If we assume that the fall in prices of materials and the greater efficiency of equipment and working apply equally to the pulp and paper sections of the mills, we may fairly ascribe the fact that there has been a greater fall in the cost of paper manufacture than in the cost of pulp manufacture to the increase in the output of paper. This assumption is confirmed by a comparison of the following figures:—

TABLE XXXV.

	Percentage of decrease between 1924-25 and 1930-31 of cost of manufacture of		Percentage increase of output of paper. 1924-25 and 1930-31.
	Pulp.	Paper.	
Titaghur Paper Mills Co. .	14·3	23·0	23·8
Bengal Paper Mill Co. .	38·9	43·8	45·2
India Paper Pulp Co. .	13·5	34·6	143·1

The greatest difference in the matter of reduction of cost between pulp and paper has occurred at Naihati, where the increase in the output of paper has been greatest.

Fall in the cost of primary materials.

62. Of the primary materials, the fall in the price of bamboo has been noticed in discussing in the previous Chapter the cost of extracting bamboo. The Naihati bamboo cost Rs. 54·72 a ton at the mill in 1924-25; for 1930-31 the cost is taken as Rs. 44 a ton, a fraction above the average cost of the two years 1929-30 and 1930-31. The fall in price is to be attributed to growing familiarity with bamboo as a paper making material, to the employment of contractors as opposed to departmental working and to some extent to competition among the contractors. As regards grass the Tariff Board in 1925 formed the opinion that the mills would probably never be able " to collect the quantity of grass they require for less than Rs. 50 a ton on the average ". The Titaghur Paper Mills Company used in 1930-31 about 2,000 tons less grass than in 1924-25 and there has been a fall in consumption of 1,200 tons by the Bengal Paper Mill Company in the same period. In 1924-25 the Titaghur Paper Mills Company paid on the average Rs. 63-14 a ton for their grass from all sources; and in 1930-31 the corresponding price had fallen to Rs. 49-6-3 a ton. The average price paid by the Bengal Paper Mill Company was Rs. 65-3 a ton in 1924 and Rs. 52-12-0 in 1930; but their average cost for the current year is 2 annas 10 pies a maund lower than in 1930, which means a saving of nearly Rs. 5 a ton. Thus both these Companies have succeeded in getting their grass at a price below the Rs. 50 a ton which the Tariff Board in 1925 considered the lowest price attainable. Both Companies attribute the fall in price to the fact that they have—Titaghur completely and Raniganj partly—got their supplies from contractors instead of by departmental working. The Titaghur Paper Mills Company think that the development of the Bamboo Pulp industry may have influenced the contractors to quote lower rates. The Bengal Paper Mill Company have reduced very substantially the cost of grass from the two areas which they still work departmentally; the cost of grass from Ramnagar has come down from Rs. 60-14-0 a ton in 1924-25 to Rs. 49-11-0 a ton in 1930-31; while that from Chota Nagpur which cost Rs. 58-6-0 a ton in 1924-25 cost only Rs. 44-14-0 in 1930-31. They have reduced their transport and extraction charges and by better packing they get more grass into a wagon and so save on freight and besides these economies in working there has also been a reduction in railway freights which has given a further saving. For example there has been a fall in transport charges from Ramnagar of Rs. 2-13-6 a ton; of this Rs. 1-15-6 a ton represents reduced freight and 14 annas a ton better packing. The reduction in the price of grass—22·7 per cent. in the case of the Titaghur Paper Mills Company and 19·1 per cent. in the case of the Bengal Paper Mill Company—has been mainly brought about by more efficient working on the part of the Companies themselves and of their contractors.

Auxiliary Materials.

63. The auxiliary materials used in the manufacture of pulp vary with the process adopted for the manufacture. The India Paper Pulp Company who use the acid process for the digestion of bamboo use principally sulphur and magnesite. In 1924-25 the consumption of sulphur was 5·08 cwts. per ton of pulp and the price was Rs. 5·308 a cwt. In 1930-31 the quantity of sulphur consumed was approximately 14 per cent. of the weight of the bamboo treated or for the 2·273 tons of bamboo required for a ton of dry pulp, 6·36 cwts; but the price had fallen to Rs. 4-14-0 a cwt. The increased consumption of sulphur was due to an attempt to do away with bad cooks. The mill finds it cheaper to use more sulphur than to spoil the appearance of the paper. Better mechanical treatment of the bamboo will lead to a reduction in the consumption of sulphur; a saving of at least 35 per cent. is anticipated, 20 per cent. by better recovery and 15 per cent. by better crushing of the bamboo. The consumption of magnesite in 1924-25 was 4·32 cwts. per ton of dry pulp produced and the price Rs. 5·75 per cwt. In 1930-31 the consumption had fallen slightly to 4·18 cwts. and the price to Rs. 5·58.

Soda Recovery.

64. We now turn to the materials used in the manufacture of grass pulp at Titaghur and Raniganj. Both Companies use the soda process; but whereas the Titaghur Paper Mills Company manufacture the soda they use in their grass mill, the Bengal Paper Mill Company buy their requirements. The cost of the chemicals used in the manufacture of pulp has fallen by 15 per cent. at Titaghur and by 53 per cent. at Raniganj. While this reduction in cost is in part due to the fall in the price of the materials, it represents in part improvement in the working of the soda recovery plant at both mills and the greater saving at Raniganj reflects the more efficient working of the recovery plant at that mill. The Titaghur Paper Mills Company have increased the percentage of soda recovered from 38 to 51; while the increase at Raniganj has been from 49 to 78. This last figure approaches within reasonable distance of the normal European figure of 84 or 85 in Esparto mills. Since the *sabai* grass used in the Indian mills retains the soda instead of releasing it like esparto grass, it is unlikely that the Indian mills will reach the European percentage of recovery. But the Bengal Paper Mill Company think that better results might be obtained by cutting their *sabai* grass into shorter lengths. Even as things are, to have attained a 78 per cent. recovery marks a very great increase of efficiency on the part of the Raniganj mill. The Titaghur mill has improved its recovery to a lesser degree; but it is still much below what it ought to be. The Company explain that with the same digesters and recovery plant at their No. 1 mill they cooked in 1930-31 54·62 per cent. more grass than in 1924-25. The extra quantity of grass cooked resulted in the production of greater quantities of black liquor to be treated in the recovery plant; and they claim that to have treated this increased quantity and at the same time to have improved their percentage of recovery from 38

to 51 is deserving of credit. The fact is that the Company have deferred carrying out badly needed extensions of their digesting and recovery plant at No. 1 mill until definite conclusions can be drawn from the work on bamboo at their No. 2 mill as to the most suitable size and type of digester.

Power and Fuel.

65. The large reduction in the costs under the head "Power and Fuel" represents partly a fall in the price of coal, partly the substitution for better coal of coal of an inferior quality, and partly increased efficiency of the power plants at the mills resulting in a lower consumption of coal. The reduction in the cost of coal used in the manufacture of pulp amounts to 35·6 per cent. at Naihati, 31·7 per cent. at Titaghur and 67·1 per cent. at Raniganj. The reductions in the cost of coal used in converting pulp into paper amount to 64·9 per cent. by the India Paper Pulp Company, 53·1 per cent. by the Titaghur Paper Mills Company and 75·3 per cent. by the Bengal Paper Mill Company. It was of Raniganj that the Tariff Board in 1925 said that the coal consumption was altogether excessive, due both to inefficient working and to out-of-date equipment and the greater saving in the costs under this head at Raniganj represents special measures taken to cure the defects noticed in 1925. In discussing the progress of the manufacture of bamboo pulp we have noticed the measures taken to improve the efficiency of the power plant at Naihati and at the Titaghur Paper Mills Company's No. II mill at Kankinara. At the Titaghur Paper Mills Company's No. I mill the boilers have been adapted to the consumption of cheaper grades of coal; a new and larger turbo-electric unit has been installed, making it necessary to raise the working steam pressure from 150 to 200 lbs. per square inch and to increase the temperature of the steam superheat from 150°F to 250°F; the original superheater units were replaced by units of larger capacity and a complete steam reducing and desuperheating equipment has also been installed so that steam of the proper temperature and pressure can, when necessary, be supplied to one of the old 1,500 k.w. turbo alternators, as well as to the engines driving the paper making machines and to the digester department. This has involved expenditure of Rs. 2·10 lakhs. At Raniganj the Bengal Paper Mill Company have installed two new water tube boilers and renewed the whole of their steam ranges with steel piping, new valves, and special high pressure steam traps. They have also installed an 1,100 k.w. steam turbine complete with all necessary accessories and have made considerable progress with the electrification of the mill. The economies produced by these improvements of the power plant consist partly in a lower consumption of coal and partly in the substitution of inferior for better grades of coal. On the whole process of pulp and paper manufacture the Titaghur Paper Mills Company show a reduction of consumption from 5·50 tons in 1924-25 to 4·16 tons per ton of paper made; the India Paper Pulp Company show a reduction from 4·96 to 2·49 tons per ton of paper and the Bengal Paper Mill Company a reduction from 7·04 tons in 1925 to 4·3

tons in 1930 and 3·7 tons in 1931. But, as we have already pointed out, these comparisons are vitiated by the increased use by all the Companies of imported pulp and we have therefore been at pains to ascertain from the Companies their consumption of coal in the manufacture of pulp and in the conversion of pulp to paper separately. The figures per ton of air dry pulp are as follows:—

TABLE XXXVI.

Consumption of coal per ton of unbleached pulp manufactured.

	Titaghur Paper Mills Company.	Bengal Paper Mill Company.	India Paper Pulp Company.
	Tons.	Tons.	Tons.
1924-25	2·02	...	2·34
1930-31	1·83	2·12	2·50

TABLE XXXVII.

Consumption of coal per ton of unbleached pulp converted into paper.

	Titaghur Paper Mills Company.	Bengal Paper Mill Company.	India Paper Pulp Company.
	Tons.	Tons.	Tons.
1924-25	4·20	...	2·60
1930-31	3·07	3·14	1·44

N.B.—The Bengal Paper Mill Company have not given separate figures for their consumption of coal in 1924-25. If their total consumption (7·04 tons) were distributed in the same proportion as their consumption in 1930-31, the figures would be 2·84 tons consumed on pulp and 4·20 tons on paper.

In order to appreciate the full extent of the reduction it is necessary to indicate the difference in the classes of coal used since 1924-25. The Titaghur Paper Mills Company now use slack coal costing Rs. 6-1-9 a ton, whereas in 1924-25 they used 1st class steam coal costing Rs. 9-12 a ton. The India Paper Pulp Company are now using slack costing Rs. 6-4 a ton as compared with 2nd class steam coal costing Rs. 10-6 a ton in 1924-25. The Bengal Paper Mill Company, who in 1924-25 used 25 per cent. 1st class and 75 per cent. 2nd grade coal at an average cost of Rs. 8-12 a ton, in 1930 paid on the average Rs. 4 a ton for coal mostly inferior. The India Paper Pulp Company attribute the slight increase of consumption of coal on pulp manufacture in 1930-31 to the use of inferior grade coal. It is manifest that apart altogether from the fall in the price of coal there has been an all round improvement in the efficiency of the power equipment and practice of the mills. The sum of the two figures given for each year in the preceding Tables represents the quantity of coal consumed in the whole process of manufacture on the present output of pulp and of paper. But since the figures are given per ton of unbleached pulp, it will be necessary to make two adjustments in order to get the consumption per ton of finished paper. On the one hand, the total figure should be increased in proportion to the wastage between pulp and paper On the other hand, the figures thus arrived at should be reduced in proportion to the amount of loading in the paper since loading adds to the weight of the paper. As regards these two factors there is considerable difference in the practice of the mills. But if it is presumed, as the Tariff Board did in 1925 (Footnote. page 34) that the wastage between pulp and paper is made up by loading, the sum of the two figures given for each year in the Tables may be taken for purposes of rough calculation as the total consumption of coal per ton of finished paper. We have not attempted an exact calculation of the consumption of coal in each mill per ton of finished paper because the economy due to loading is an unreal one and figures based on it may give a misleading view of the situation. It will be noticed however that the coal consumption, taking the manufacture of pulp and its conversion into paper together, is lower at Naihati than at the other mills. The Tariff Board assumed in 1925 that this difference was due to the employment of the acid process although no definite statement to that effect was given in evidence (Footnote, page 43). This assumption does not appear to us to be correct since the consumption of coal in the manufacture of pulp is higher at Naihati than at the other mills. It is at the pulp stage that the economy due to the method of digestion employed should be apparent. In view of the fact that both steaming time is longer and digestion temperature higher in the acid than in the alkali process, the higher consumption of coal in pulp manufacture at Naihati as shown in the Table appears justified. The fact that the total consumption of coal per ton of paper is lower at Naihati should, we think, be attributed mainly to the superior efficiency of their power plant and practice and to the more up to date character of their paper plant.

Labour and supervision; Stores and miscellaneous.

66. The costs under other heads show comparatively slight variation and call for little comment. We have already noticed the method by which these costs at Naihati are allocated between pulp and paper manufacture. The reduction in labour charges at Titaghur is due to a reduction of the labour employed in carrying, picking and dusting grass. The increase under "other charges" at Titaghur is caused by higher expenditure on repairs in the digester and soda recovery plant. The increase of establishment costs at Raniganj is due to the payment of bonus and tonnage to the staff in 1930. In considering these costs in the manufacture of paper it must be remembered that the reduction of the charges for labour, repairs, and other such charges is in part due to the great increase in the quantity of paper manufactured. We are informed that with the mills working pratically to capacity, the cost of making paper is practically the same whether it is made from the mills' own pulp or from imported wood pulp; though one mill has expressed the opinion that more power is required to beat bamboo than wood pulp costing approximately an additional 8 annas a ton and that grass pulp needs more steam and power than either wood pulp or bamboo.

China clay and other auxiliary materials.

67. The cost statements show a substantial fall in the cost of bleach and other chemicals used in paper making. This fall is of course partly due to the fall in the price of the materials; but it is also due to a reduction in the consumption of such materials as China clay, bleach and rosin. The Titaghur Paper Mills Company have reduced the proportion of bleach to bone dry unbleached pulp from 18 per cent. in 1924-25 to 15 per cent. in 1930-31; and the India Paper Pulp Company have made a similar reduction from 17·8 per cent. in 1924-25 to 12·9 per cent. in 1930-31. The following statement shows for each Company the proportion to finished paper (without loading) borne by (1) China clay and (2) all the other auxiliary materials used both in the manufacture of pulp and in the conversion of pulp to paper. The reduction in the proportion of China clay consumed indicates the improvement in the quality of their paper, and the reduction in the proportion of auxiliary materials used indicates greater economy in manufacture.

TABLE XXXVIII.

Statement showing the proportion per cent. to finished paper (without loading) of (a) *China clay,* (b) *other auxiliary materials.*

—	Titaghur Paper Mills Company.		Bengal Paper Mill Company.		India Paper Pulp Company.	
	China clay	Other auxiliary materials.	China clay.	Other auxiliary materials.	China clay.	Other auxiliary materials
1924-25	23·8	64·5	26·2	55·7	7·9	64·4
1925-26	27·0	47·2	31·1	52·5	5·8	65·2
1926-27	21·2	52·3	22·9	43·3	9·2	58·6
1927-28	20·2	47·7	20·9	43·5	8·8	44·2
1928-29	20·4	41·5	22·5	33·4	7·1	37·5
1929-30	18·2	44·4	16·2	36·9	7·8	38·2
1930-31	16·4	52·5	14·5	32·6	8·7	37·1

Yield of fibre; (a) Grass.

68. The Tariff Board in 1925 observed that all the evidence then recorded pointed to the fact that 3 tons of *sabai* grass were required to make a ton of paper, provided no account was taken of the weight of the sizing and loading materials used. The wastage was divided between pulp manufacture and paper manufacture differently by the Titaghur Paper Mills Company and by Mr. Raitt, the Government Cellulose Expert.

TABLE XXXIX.

	Grass.	Pulp.	Paper.
Titaghur Paper Mills Co. . .	100	44·4	33·3
Mr. Raitt	100	40	33·3

Since the pulp is manufactured only for use in the mill and remains moist throughout the process of manufacture the exact quantity produced is not readily ascertainable with strict accuracy. The evidence placed before us at this enquiry gives the following distribution of the wastage between pulp manufacture and paper manufacture at the Titaghur Paper Mills Company and the Bengal Paper Mill Company at present.

TABLE XL.

	Grass.	Air dry unbleached pulp.	Paper.
Titaghur Paper Mills Co. .	100	45·10	34·55
Bengal Paper Mill Co. . .	100	53·00	42·00

At Titaghur the yield of pulp estimated in 1924-25 was 48·38 per cent. and the yield of paper 31·86 per cent. The fall in the yield of pulp is ascribed partly to the fact that the quantity of grass treated at the mill in 1930-31 was 54·62 per cent. greater than in 1924-25, while no addition was made to the digestion plant, and partly to the fact that in 1928 the mill discontinued the use of waste materials for the manufacture of wrappers. The Company claim however with some justice that since the article manufactured in the mill is paper and not pulp, their efficiency should be judged by the yield into paper rather than by the yield into pulp which is merely an intermediate product. The general practice is to calculate the yield into paper by first assuming the yield from all materials other than grass at an average percentage rate and then taking the balance as the yield from grass. This means that the grass has to bear the gains or losses of all the materials; but it is justified by the fact that grass is the most variable factor of all the materials used. The Titaghur Paper Mills Company have however placed before us statements which give a more accurate picture of the improvement of their yield. They first take the quantity of each material used, and then compare their total output with the quantity of paper which ought to have been produced by the materials used at ratios generally accepted in the trade. The difference is treated as a loss in yield and is distributed proportionately to each material. Thus the quantities of materials used and the tonnage of paper which they should have produced at the standard ratios are as under for 1924-25 and 1930-31:—

TABLE XLI.

Material.	Standard ratio of yield.	Tons of materials used.		Tons of paper at rate in Column 2.	
		1924-25.	1930-31.	1924-25.	1930-31.
1	2	3	4	5	6
	Per cent.				
Grass	35	18,791	15,663	6,577	5,482
Bamboo	38	2	5,526	1	2,100
Rags	60	807	162	484	97
Rope, hemp	60	398	759	238	456
Waste paper	75	1,981	1,505	1,486	1,128
Wood pulp	85	6,725	10,026	5,716	8,522
China clay	60	3,241	2,880	1,944	1,728
Total	...	...	...	16,446	19,513
Actual quantity of paper produced	...	...	...	15,556	19,260
Loss	...	...	..	890	253

And in the following statement the loss is distributed proportionately between the various materials. To make the comparison more exact the figures for wrappers which were not manufactured in 1930-31 have been excluded from the manufactures of 1924-25.

TABLE XLII.

Material.	Standard ratio of yield.	Tons of materials used.		Tons of paper made.		Percentage yield.	
		1924-25.	1930-31.	1924-25.	1930-31.	1924-25.	1930-31.
	Per cent.						
Grass	35	18,791	15,663	5,987	5,411	31·86	34·55
Bamboo	38	2	5,526	1	2,073	..	37·51
Rags	60	807	162	441	96	54·65	59·26
Rope, hemp	60	398	759	216	450	54·27	59·29
Waste paper	75	1,981	1,505	1,353	1,113	68·35	73·95
Wood pulp	85	6,725	10,026	5,202	8,411	77·35	83·89
China clay	60	3,241	2,880	1,770	1,706	54·61	59·24

The close approximation of the actual yield now obtained at the mills to the generally accepted standards is sufficient justification of the Company's statement that in this respect their practice is reasonably efficient. There are two reasons for the relatively high yield obtained by the Bengal Paper Mill Company. In the first place the proportion of unbleached paper made in this mill is considerably higher than at the other mills and consequently there is less loss of fibre in bleaching. Secondly, the quantity of wrappers made is so large that it is possible to use a great deal of waste material, *e.g.*, leaves and other rubbish found among the grass, and fibre recovered from the waste water of the mill. The figure of 42 per cent. given by the Bengal Paper Mill Company as representing their yield of paper from grass is therefore not strictly comparable with the figure given by the Titaghur Paper Mills Company nor with the standard figure given in Table XLI. The reason for the improvement in yield at the Bengal Paper Mill between 1924-25 and 1930-31 is the introduction of better methods of straining and fibre recovery.

(*b*) Bamboo.

69. The India Paper Pulp Company now obtain a yield of 49 per cent. air dry unbleached pulp from bone dry bamboo which represents approximately a yield of 44·5 per cent. from ordinary air dry bamboo. Since the available cellulose content of bamboo on an air dry basis does not exceed 48 per cent., it is likely that the yield obtained at the Naihati mill is little short of the maximum which may be obtained under commercial conditions. The highest yield of unbleached bamboo pulp attained at Dehra Dun is 45 per cent. with which the Naihati figure compares favourably. In the process of converting bamboo pulp into paper the Company now lose about 4½ per cent. of the fibre on a bone dry basis as compared with a loss of 5½ per cent. in 1924-25. The improvement is due entirely to a less drastic method of bleaching which involves less fibre loss. If the loss in converting pulp into paper is calculated on an air dry basis, it may be estimated that 2·61 tons of air dry bamboo are required to make one ton of paper, representing a yield of approximately 38 per cent. of paper. It will be noticed from Table XLI that this is considered the standard ratio of yield of paper from bamboo. The figures of yield from bamboo as given by the Titaghur Paper Mills Company on a year's working at their Kankinara mill appear to approximate closely to the Indian Paper Pulp Company's figures. But the period of working on which the Titaghur Paper Mills Company's figures are based is too short to justify us in accepting them as indicating an established level of efficiency.

The quality of Indian made paper.

70. The final test of efficiency after all is the quality of the paper manufactured. All the evidence we have received on this subject indicates that in the last six years there has been a great improvement in the quality of the paper manufactured in the Indian mills. The Controller of Stationery and Printing, who buys on behalf of the Government about 25 per cent. of the products of the mills not only expresses this opinion, but supports it with the results of tests over a series of years. Instances of these tests are given in the following statement, from which may be judged the improvement in the quality of the white printings and unbleached printings which constitute the bulk of the Controller's purchases, tendered in recent years.

TABLE XLIII.

Test results of samples accepted by the Controller of Printing and Stationery.

—	1925-26.				1931-32.			
	Grammes per sq. metre.	Breaking length in inches.	Fold.	Ash per cent.	Grammes per sq. metre.	Breaking length in inches.	Fold.	Ash per cent.
White Printing.								
Titaghur Paper Mills Company .	61·3	3,009	19	9·4	73·6	4,149	73	4·1
Bengal Paper Mill Company .	56·3	2,954	15	18·4	73·6	3,944	73	2·8
India Paper Pulp Company .	54·1	2,012	2	11·8	73·6	3,204	137	8·0
Unbleached Printing.								
Titaghur Paper Mills Company .	73·6	2,971	29	14·4	73·6	2,383	33	10·2
Bengal Paper Mill Company .	73·6	3,616	24	14·2	73·6	3,781	74	3·0
India Paper Pulp Company .	61·3	2,762	8	2·0	73·6	2,958	89	5·2

The Controller also quotes records of comparison between the Indian made paper and imported papers tendered for supply to the Government, which show that in recent years importers have been unable to offer paper of equal quality to that made in the Indian mills at equal or lower prices. The importers and traders themselves admit the improvement in the quality of the Indian manufacture, but ascribe it to the increased use of wood pulp. The Titaghur Paper Mills Company, claiming 100 per cent. improvement in the quality of the paper manufactured at their No. 1 mill, point out that so far as this mill is concerned the improvement cannot possibly be attributed to the use of wood pulp and illustrate their contention by the following statement of the proportion of finished paper represented by each of the materials used:—

TABLE XLIV.

Material.	1924-25.		1930-31.		Increase or decrease.
	Quantity used.	Percentage of total paper made.	Quantity used.	Percentage of total paper made.	
					Per cent.
Grass . .	3,239 08	45·52	5,208·91	54·82	+ 60·8
Other indigenous fibres .	548·73	7·71	125·76	1·33	—77
China clay . . .	977·28	13·74	853·50	8·98	—12·66
Wood pulp . . .	2,349·91	33·03	3,312·83	34·87	+ 40·97

The proportion of grass represented in paper has increased far more than the proportion of wood pulp; and if the improvement is to be attributed to either material, grass rather than wood pulp must get the credit. As a matter of fact the improvement of the quality of the paper made in this mill, as in others, is due to the provision of better equipment and to all the work done in the way of general mill improvement.

CHAPTER VI.

The claim for continued protection.

Procedure in examining the claim to continued protection.

71. In its Report in 1925 the Tariff Board held that the existing grass mills did not satisfy the conditions laid down by the Fiscal Commission and that if the Indian Paper industry depended chiefly on *sabai* grass for its primary material, there would be no case for protection. The principal grounds on which the Board came to this conclusion were first, that it was unlikely that the supply of *sabai* grass available in India would be adequate to meet the needs of a growing industry based on grass, secondly, that even if the supply of grass could be increased, its cost would be such as to render any extension of the manufacture of paper based on it uneconomical and, thirdly, that there was only a limited market in India for papers of the sorts manufactured principally from grass and unless there was an alternative material suitable for the manufacture of a large variety of papers, the future development of the industry would be hampered. On the other hand, the Board found as regards bamboo that sufficient supplies of raw material were available in India and that the qualities of bamboo fibre made it a suitable material for the manufacture of most classes of paper which are in demand in India. But in view of the fact that at the time it reported the work done on bamboo had been more or less of an experimental character it was unable to come to any definite conclusion as to whether the manufacture of paper from bamboo would prove economical. It found that the Paper industry, as far as bamboo was concerned, satisfied the first and second conditions laid down by the Fiscal Commission but on the information at its disposal it was unable to express any definite opinion with regard to the third condition. Our purpose in this Chapter is to determine how far on the evidence we have received in the present enquiry the findings of the Board in 1925 with regard to the possibilities of grass and bamboo as raw materials for the Paper industry may be accepted or should be modified. If it is found that these conclusions are in the main confirmed by the information we have received and if further it is established that the experience of the mills since 1925 holds out a reasonable prospect of the Paper industry being able eventually to dispense with protection, it may be concluded that the industry satisfies the conditions laid down by the Fiscal Commission.

The supplies of *sabai* grass.

72. The total available supply of *sabai* grass in the provinces of Bihar and Orissa, United Provinces and the Punjab as estimated approximately by the Forest Department is 50,000 tons annually. On a rough estimate this corresponds to 25,000 tons of finished paper with a furnish of 70 per cent. grass and 30 per cent. other

materials. The annual production of the mills situated in Bengal and the United Provinces is about 35,000 tons of paper and it would appear that the supply of raw material falls far short of the requirements of the industry. The Titaghur Paper Mills Company in their evidence before the Board in 1924 stated that the total supplies of grass available to them in the three areas over which they held leases were 11 lakhs of maunds. It is now stated that the total supplies available in these areas are only 10 lakhs. The reduction has occurred in the Sahebgunge area which is nearest to the mills. The question of improving the supply of grass available in this area is now under the consideration of the Forest Department but for the time being a considerable reduction must be anticipated. The following Table shows the variations in the available supplies of grass in the three areas since 1923-24:—

TABLE XLV.

Area.	Average distance.	Supplies estimated in 1923-24.	Supplies estimated in 1930-31.
	Miles.	Mds.	Mds.
Western Circle	920	4 lakhs.	5 lakhs.
Nepal	580	3 ,,	3 ,,
Sahebgunge and Eastern Circle .	230	4 ,,	2 ,,
Total .	...	11 ,,	10 ,,

It will be seen that any large increase in the demand for grass will necessitate the exploitation of areas situated farther away from the mills and a consequent increase in costs. Meanwhile the Company have lost their lease over the Western Circle. Although this may not mean any immediate reduction in the supplies of grass required by the Company, it is not unlikely that after a few years serious difficulties may be experienced in drawing supplies from this area. The quantity available in the three areas as estimated at present will be just sufficient for the total output of the Company if a grass furnish of 70 per cent. is assumed. But if the Sahebgunge area shows further reduction and the Company are unable to draw freely on the Western Circle, the total supplies of grass will be entirely inadequate for an output equivalent to the full capacity of the Company's mills. The Bengal Paper Mill Company have sent us a statement showing the quantity of grass available to them. From this it would appear that a total supply of 18,000 tons a year may be obtained roughly equivalent to the full capacity of the mill. In the light of the information supplied by the Forest Department this appears to be an over-estimate, but it is in any case certain that if both the mills in Bengal which now use grass were to use considerably increased quantities the demand would be greater than could be met from the existing resources.

The cost of *sabai* grass.

73. The Tariff Board in 1925 estimated that the cost of grass delivered at the mills would not be below Rs. 50 a ton. The average cost of grass at the Titaghur Paper Company's mills in 1924-25 was Rs. 63-14. The average cost in 1930-31 was Rs. 49-6-3 which is not merely lower than the actual cost before 1925 but is slightly lower than the minimum cost estimated by the Board. The average cost of grass to the Bengal Paper Mill Company in 1930 was Rs. 52-12 per ton. A further reduction of 2 annas 10 pies a maund has occurred this year which will reduce the average cost to nearly Rs. 47-8 a ton. The average cost of grass at Raniganj in 1924-25 was Rs. 65-3 a ton. The reasons for this marked fall in the price of grass have been discussed in Chapter V. As regards cost, therefore, the position of *sabai* grass has considerably improved since 1925.

The cost of paper made from *sabai* grass.

74. It is necessary however to ascertain whether at the present price of grass the manufacture of paper made mainly from grass is economical. For this purpose we asked the Titaghur and Raniganj Mills to prepare estimates of the cost of manufacturing paper on the assumption that approximately 70 per cent. of the furnish was composed of grass and that the mills were working to full capacity. The Titaghur Paper Mills Company's estimate of the works cost on this basis is Rs. 363·4 per ton of paper on the assumption that no additional electrolytic or soda recovery plant is installed and that it would be necessary to purchase the extra caustic soda required. We think that any reduction in costs on this account will be counterbalanced by the increase which will necessarily take place in the cost of grass if both the Titaghur and Raniganj Mills produce grass paper on this scale. The cost of grass has been taken for the purpose of this estimate as Rs. 51 a ton as against Rs. 49-6-3 in 1930-31. In view of the shortage of grass supplies, the addition to the cost of grass if grass were demanded on this scale would be higher than the Company have allowed for. The Raniganj Mills estimate of the cost of paper composed mainly of grass is nearly Rs. 34 lower than the Titaghur estimate. But, as the Company themselves admit, they are in a less favourable position for making an estimate with reasonable accuracy. They state "The introduction of so much grass into our productions would, as the mills are to-day positioned, be an impossibility and it is upon this account that we find it difficult to prepare an acceptable statement which could be adhered to in general mill practice. The use of such a large quantity of grass would necessitate considerable increase of capital expenditure for the extra plant that would be required . . . . . Owing to the nature of *sabai* grass larger time would have to be devoted to beating, and if the present output was to be maintained it would be necessary to increase the number of beaters and arrange for additional drying power at the paper machines". On the other hand, the Titaghur Paper Mills Company at their No. 1 mill are at present engaged in the production of paper containing approximately 70 per cent. grass furnish and their estimated costs for paper of this class may therefore be

accepted as reliable. As we have already stated, according to their estimate the works cost of paper made predominantly of grass on full production will be Rs. 363. As will be seen in Chapter VII the overhead charges and profit per ton of paper as estimated by us amount to Rs. 137. Adding this to the works cost, we get a minimum price of Rs. 500 per ton of paper. This is so far above the present duty free price of imported paper that unless a duty considerably higher than the existing protective duty was imposed, the industry would be unable to meet foreign competition.

Limited market for paper made mainly from *sabai* grass.

75. It is generally admitted that the market for paper made mainly of grass is of a restricted character and that even if the cost of production of such paper were sufficiently low, it would be impossible to sell more than limited quantities of it. The Tariff Board reported in 1925 as follows:—

> "Our review of the evidence suggests the inference that there is a natural limit to the quantity of paper which, under existing conditions, can profitably be made from this material, and that this limit has already been approached, if not exceeded."

The Calcutta Paper Import Association have confirmed this opinion in the representation they have submitted to us in the present enquiry. The opinion of the Indian mills also appears to be to the same effect. In reply to our question whether, if the mills produced paper composed chiefly of grass up to their full capacity, there would be any difficulties regarding marketing, the Titaghur Paper Mills Company state that if their mills were producing at full capacity paper with a 70 per cent. grass furnish the possibility of marketing the products might present difficulties. The Bengal Paper Mills Company state "The introduction of so much grass into all our papers would not permit us to produce the variety of qualities which we manufacture to-day".

Board's previous findings regarding *sabai* grass confirmed.

76. On the facts set out in the preceding paragraphs, we find that the existing supplies of *sabai* grass are insufficient to allow for an expansion of the Paper industry if based mainly on grass, that any extension of the output of paper composed chiefly of grass will make it more difficult for the industry to dispense with protection and that the Indian market will be unable to absorb larger quantities of such paper. Our examination of the evidence in this enquiry has confirmed the findings of the Tariff Board on the subject of *sabai* grass in 1925.

Difficulties in developing bamboo explained.

77. As regards bamboo, the estimated quantities of raw bamboo available have been already set out (*see* Chapter IV) from which it will be seen that there are ample supplies available at economical costs. The efforts made by the existing mills and the total capital expenditure incurred by them for this purpose in the direction of developing machinery and methods of manufacture suitable for bamboo have also been discussed. On a review of the evidence

before us we find that the delay in the development of bamboo as a raw material for paper has been due to two causes for neither of which the paper Companies can be held responsible. The first is the inherent difficulties connected with the mechanical treatment and digestion of bamboo which have proved considerably greater than the Tariff Board and Government had anticipated. The second is the rejection by Government and the Legislature of the Tariff Board's proposal to grant direct financial assistance to the Companies interested in the manufacture of bamboo pulp. With the rapid fall in the price of wood pulp which has occurred since 1925, a tariff arrangement which admits wood pulp free of duty while levying a high protective duty on paper has naturally served as an incentive for the manufacture of paper from imported pulp. The production of bamboo pulp at the prices at which wood pulp entered the country became impossible.

Cost of paper manufactured from bamboo by the India Paper Pulp Company.

78. Whether, on the results of the work done by the mills hitherto, the prospects of manufacturing paper from bamboo may be regarded as sufficiently promising can only be judged on an examination of the costs. We have seen in Chapter V that the total works costs of bamboo pulp at Naihati in 1930-31 was Rs. 196·6 per ton of air dry pulp on an output of 1,876 tons. This may be taken as representing the cost of manufacturing bamboo pulp on an output of approximately 2,000 tons of pulp and 6,000 tons of paper. We have obtained from the Company their estimate of future costs assuming a total production of 6,000 tons of paper and the equivalent quantity of pulp. The Company's estimate of the works costs on this basis is Rs. 156 per ton of air dry pulp. This is based on a cost of Rs. 41-6 per ton of bone dry bamboo as against Rs. 44 in the present works cost. The bamboo in this case is from Assam which is at present the Company's main source of supply. But if local supplies may be obtained, the cost will be reduced approximately to Rs. 25 per ton. The consumption of sulphur in this estimate is taken at 35 per cent. below present cost and the reduction is based on the results expected from the new bamboo preparing machine when it is in full operation. The cost of magnesite shows a reduction of 15 per cent. compared with the present cost and this too is attributed to the better mechanical treatment of bamboo possible with the new machine. The cost of coal shows a reduction of 35 per cent. based partly on the saving due to more efficient crushing of the raw bamboo and to increased output and partly on the results which may be expected if what is called the Deckering system of cooking is introduced. This system implies the use of at least three digesters and since the Company have only two at present, we shall not be justified in including the economies anticipated from it at this stage. The Company's estimate is that the saving on coal apart from the Deckering system will not exceed 25 per cent., which we accept for the purpose of this calculation. The reductions under wages, stores and supervision and miscellaneous are based directly on the economies due to increased output and appear to us to be

reasonable. The works cost per ton of bamboo pulp at Naihati on the present output and on the proposed output are shown below:—

TABLE XLVI.

	Cost on present output per ton. Bone dry. Rs.	Cost on proposed output per ton. Bone dry. Rs.
Bamboo	100·00	94·04
Sulphur	31·01	20·16
Magnesite	23·25	19·76
Coal	17·37	13·03
Wages	23·54	12·71
Stores	14·18	11·34
Supervision	4·30	1·44
Miscellaneous	4·85	2·42
Per ton Bone dry	218·50	174·90
Per ton Air dry	196·65	157·41

The output of the paper section of the mill at Naihati is now over 6,000 tons, which represents its maximum capacity. The cost at which pulp is converted into paper on the present output may, therefore, be regarded as the lowest which may be attained with the present plant. Hence we shall be justified in assuming that if the cost of bamboo pulp is taken at the figure we have estimated on the proposed output as shown above, and if the cost of converting pulp into paper is taken at the present cost of conversion in the mill, we shall arrive at the future cost of manufacturing finished paper consisting of 100 per cent. bamboo furnish on full output. As we have shown in Chapter V, the cost of converting unbleached pulp into paper at Naihati in 1930-31, excluding (1) loss of fibre and (2) cost of china clay, was Rs. 124·3 per ton of unbleached pulp bone dry which is equivalent to Rs. 129·9 per ton of paper. We have estimated the cost of bamboo pulp on full output at Rs. 174·9 per ton bone dry. The wastage in conversion is approximately 4½ per cent. per ton of bone dry pulp which on Rs. 174·9 amounts to Rs. 7·8. The cost of manufacturing paper, excluding the cost of China clay, per ton of paper is thus:—

	Rs.
Cost of pulp	174·9
Loss of fibre	7·8
Cost of conversion	129·9
	312·6

The cost of China clay in 1930-31 was Rs. 5·1 per ton of finished paper including loading which is equivalent to Rs. 5·4 per ton of paper excluding loading. Adding this we get a total cost of Rs. 318. Since on the proportions in use at Naihati China clay adds about 6 per cent. to the weight of paper representing 75 per cent. of the quantity of clay used, the works cost per ton of finished paper may be taken as Rs. $318 \times \frac{100}{106}$ = Rs. 300. This is our estimate of the future works cost of paper consisting of 100 per cent. bamboo furnish on full output. Adding to this overheads at Rs. 73 and profit at Rs. 64 per ton (*see* Chapter VII, paragraph 92) we get a selling price of Rs. 437. It will be seen from Chapter VII that we assume Rs. 341 as the average duty free price likely to be realised by the mills in the near future. On these figures we find that, assuming a revenue duty of 20 per cent., a Company manufacturing paper from bamboo pulp will, even if no increase in prices occurs, eventually be able to meet all works costs and overhead charges and in addition earn a profit of nearly 5 per cent. It must, however, be remembered that present prices are abnormal prices and it would be unfair to the bamboo pulp industry to decide the question of protection with reference to the prices prevailing at a time of acute world depression. The average duty free price of paper in 1924-25 when the Board made its original enquiry was 3 annas per lb. or Rs. 420 per ton. At this price a company making paper entirely from bamboo pulp on an output of 6,000 tons would be able to meet works costs and overhead charges and earn full profit with a revenue duty of less than 5 per cent. It will be realised that if instead of the whole paper being made of bamboo some portion of the furnish is composed of cheaper materials than bamboo pulp such as waste paper or rags, the cost will be still lower.

Reductions likely in cost of bamboo.

79. In the above estimate of the selling price of paper made from bamboo the cost of bamboo is taken at Rs. 41-6 per ton of bone dry bamboo. As has been pointed out, this is considerably higher than the prices at which bamboo has been obtained during the current year not merely by the India Paper Pulp Company, but also by the other Companies working in Bengal. Prices as low as Rs. 22-8 per ton bone dry have been reached. If we assume a price of Rs. 25 per ton of bone dry bamboo a reduction of approximately Rs. 40 per ton of paper may be expected. Meanwhile the Titaghur Paper Mills Company have been investigating the question of installing a pulp mill at Cuttack for the exploitation of the bamboo in the Lower Mahanadi Basin. There are good facilities here for water transport from the forests down to Cuttack by the Mahanadi over which rafting would be possible for about six months in the year. The coalfields of Talcher are near by. The scheme is still in its early stages, but has a great deal to commend it and the Tariff Board in 1925 considered Cuttack a suitable centre for the location of a pulp mill. A rough estimate of the works cost of pulp manufactured at a mill located at Cuttack with an output of 10,000 tons is Rs. 125 delivered at Calcutta mills.

Bamboo pulp costs at Kankinara.

80. We have also obtained from the Titaghur Paper Mills Company an estimate of their future costs of bamboo pulp on an annual output of 3,000 tons. Making allowance for a reduction from Rs. 30 to Rs. 26 a ton in the price of raw bamboo

and for more efficient recovery of soda they give the future works costs of bamboo pulp at Kankinara as Rs. 172·50 or Rs. 162·50 a ton of bone dry pulp, according as the caustic or sulphate process is used. The sulphate process is more economical, but the Company state that it is not suitable for use in a populous place like Kankinara on account of the bad smell it produces. We cannot assume that this cheaper process will reduce the cost to the lower figure given. These figures compare on an air dry basis with the present works cost as follows:—

TABLE XLVII.

	Per ton of air dry pulp.	
	Present output. 1,841 tons.	Future output. 3,000 tons.
	Rs.	Rs.
Soda	183·6	155·4
Sulphate	—	146·3

The quality of bamboo paper.

81. As regards the quality of the papers made from bamboo pulp, the finding of the Tariff Board in 1925 still holds good. The Board held that paper could be made entirely from bamboo without any admixture of wood pulp. Bamboo paper lacked the bulking quality of grass paper and could not so easily be used both for printing and for writing. On the other hand, both in finish and cleanliness of surface it was greatly superior to grass paper and did not compare unfavourably with imported paper. From the evidence it seemed clear to the Board that bamboo paper did not possess the characteristic defects and merits of grass paper and much more closely resembled the paper made from wood pulp. The Board pointed out that this was a fact of great importance because it opened up avenues of development which were closed to the Indian Paper industry so long as it was dependent solely upon *sabai* grass. A paper made from bamboo would meet the needs of those users who disliked the grass paper, and possibly bamboo pulp might take the place of wood pulp as a constituent of paper made principally from grass. We have shown in Chapter IV that the same opinion is held by the two mills who have had experience of bamboo pulp and that this opinion has been confirmed by the Forest Research Institute, Dehra Dun, the Manager of the Government of India Press and representatives of one of the biggest chemical combines in Germany.

Bamboo paper satisfies the Fiscal Commission's conditions.

82. Our conclusions regarding bamboo may be briefly summarised as follows. There are sufficient supplies of bamboo available in the country which may be used economically by the Indian mills for a large extension of the existing output of paper. Considering the handicaps under which Indian mills have worked we are satisfied with their efforts in the direction of developing the manufacture of paper from bamboo and with the progress made by them in this respect. The costs of manu-

facturing bamboo pulp which have been already attained establish a reasonable prospect of the industry being able eventually to dispense with protection. Lastly, it may be regarded as reasonably certain that bamboo paper will be able to replace the great bulk of imported paper in the Indian market. We find, therefore, that in view of the possibilities of bamboo a case for the protection of the Paper industry is established in accordance with the conditions laid down by the Fiscal Commission.

Withdrawal of protective duty must mean disappearance of bamboo pulp.

83. If the protective duty is now withdrawn there is little doubt that no mill would find it to its interest to manufacture paper or pulp from bamboo. With imported wood pulp at present prices it will be far more economical for the mills to keep the paper machines engaged mainly on the conversion of imported pulp into paper. All the work done hitherto on the development of bamboo pulp will be wasted and a potentially important raw material in the country will remain undeveloped. If the protective duty on paper is replaced by the revenue duty of 20 per cent. the realised price *ex*-mill, taking the average price free of duty at Rs. 341, will be Rs. 409. The fair selling price for a mill producing paper of 75 per cent. bamboo furnish at the present cost of bamboo pulp is Rs. 464 as estimated in Chapter VII. At a revenue duty of 20 per cent. the mill will be able to meet its works costs and overhead charges but will not earn a profit of more than Rs. 10 per ton. If the Indian mills manufactured paper consisting of 100 per cent. bamboo furnish instead of 75 per cent. the profit would be even less. On the other hand, a mill producing paper of 100 per cent. wood furnish at current prices of imported pulp will be able to make a profit of about Rs. 55 per ton of paper. This will be clear from the following calculation:—

TABLE XLVIII.

	Rs.
Current price of imported pulp delivered at mill per ton air dry	140
Cost of imported pulp per ton of paper at 86 per cent. yield	162·7
Cost of conversion per ton of paper without loading	129·9
Cost of China clay	5·4
	298·0
Allowing for weight of loading, cost per ton of finished paper (298 x 100/106)	281
Overhead charges excluding profit as shown in Chapter VII	73
	354
Present price of paper at 20 per cent. duty . .	409
Surplus (per ton of paper)	55

This is approximately 7 per cent. on our estimated capitalisation. There can be no question under these circumstances that the withdrawal of the protective duty will mean the disappearance of bamboo as a raw material for the manufacture of paper. The position of the wood pulp market in Europe which we have outlined in Chapter II indicates that a scarcity of wood pulp of a serious character may yet arise although no time may be forecasted for its occurrence. Should such a contingency eventuate a shortsighted policy at this juncture might have serious consequences.

Effect of withdrawing protective duty on companies' finances.

84. The effect upon the finances of the mills of replacing the present protective duty by a revenue duty at the present rate of 20 per cent. is shown in detail in Appendix IV. These statements have been compiled on a most conservative basis; depreciation has been calculated, not on replacement values, but on the Companies' present depreciated block; and interest on loans has been allowed at 6½ per cent. instead of the 7½ per cent. which is usually allowed by the Board. On the other hand it should be stated that no allowance has been made for the possibility that some of the mills may sell a little badami paper at rates which compete with unprotected paper. The principal buyer of badami paper is the Government who generally buy at prices based upon the protective duty, but some of this paper is sold in the bazar where it has to compete with paper containing a sufficient proportion of mechanical wood pulp to escape the protective duty. We do not believe that these quantities are considerable or that the prices at which they are sold would materially affect the situation disclosed by the statements in Appendix IV. The India Paper Pulp Company are the only Company which would be able to meet all charges; but after doing so they would not be able to pay a dividend of even 1 per cent. The Titaghur Paper Mills Company and the Bengal Paper Mill Company would be able, after meeting their works costs, to find depreciation and interest on working capital; but they would not be able to meet in full their Head Office and Managing Agents' charges nor would they be able to pay interest on their debentures or declare any dividend. The withdrawal of protection would hit the Lucknow and Deccan Companies still harder; they would not be able to cover their works costs in full and they would have no funds from which to meet charges for depreciation, interest on working capital, head office expenses or dividends. We are convinced by the statements in Appendix IV that the mills have not yet attained such a state of financial security that they can dispense with protection.

Necessity for a duty on imported wood pulp.

85. Our conclusions as stated in paragraph 83 establish the necessity of levying an import duty on wood pulp. The policy which has been adopted since 1925 of encouraging the development of bamboo paper by means of an import duty on finished

paper unaccompanied by any direct incentive for the manufacture of bamboo pulp has seriously hampered the fulfilment of the objects which the scheme of protection had in view. The Tariff Board in 1925 rejected the proposal to levy an import duty on wood pulp on various grounds. The proposal was examined from two points of view—first the development of an export market for bamboo pulp and secondly the development of a separate bamboo pulp industry in India. The Board found that neither of these would be assisted by the imposition of a duty on wood pulp and, although circumstances have altered since 1925, we recognise the force of the arguments which led to the rejection of the proposal. We base our recommendation on the ground that, with the prices of wood pulp at the present level and with no immediate prospect of any substantial increase, it is clear that unless a protective duty on paper is accompanied by an import duty on wood pulp, bamboo will be largely replaced by imported pulp. The imposition of a duty on finished paper unaccompanied by a duty on wood pulp will in our opinion defeat the scheme of protection. In one respect the situation at present is more favourable for the introduction of a duty on wood pulp. In 1925, with the exception of Naihati, the mills in Bengal had neither the equipment nor the experience required for the manufacture of paper from bamboo. If a duty on wood pulp had been imposed then the delay in organising the necessary plant and experiments would, in spite of the encouragement afforded by a duty, have failed to increase the output of bamboo pulp sufficiently. The position to-day is materially different. The mills are fairly well equipped for bamboo and have had sufficient experience of manufacturing bamboo pulp. If an incentive is provided by means of a duty on wood pulp a large development of bamboo pulp may reasonably be expected in the near future.

Circumstances regarding imported wood pulp altered since 1925.

86. The Tariff Board found at the last enquiry that the information which they received did not definitely establish that the paper industry would ultimately be able to dispense with protection. A duty on imported wood pulp as an aid for the manufacture of bamboo pulp would on this view of the case have been regarded as an unjustifiable burden. The evidence in the present enquiry has shown, as we believe, that the Paper industry substantially fulfils the third condition of the Fiscal Commission. The necessity for providing some measure of direct assistance to bamboo pulp, if protection was not to prove ineffective, was recognised by the Board in 1925 in the proposals which they made for capital assistance to the Companies engaged in the manufacture of bamboo pulp. The case for providing a direct incentive for the development of bamboo has become stronger since 1925 in view of the large and rapid fall in the price of imported pulp which has occurred. We believe that the most suitable form in which direct encouragement may be provided is the imposition of a duty on imported wood pulp. As we show in Chapter VII such a duty

can be so arranged as to throw no fresh burden either on the industry or the country.

Bamboo and grass mills to be treated alike.

87. In applying the proposals for assistance which we have recommended it is our intention that no distinction should be made between what are called grass mills and bamboo mills. Our findings regarding the prospects of grass and bamboo as raw materials for the Paper industry are substantially identical with those arrived at by the Tariff Board in 1925. But the conclusion to which we are led as the result of these findings is somewhat different from that expressed in the Board's previous report. It was stated by the Board in paragraph 156 of their Report of 1925 that it was no part of its object to adjust the scheme of protection so as to permit the grass mills to survive and that their disappearance would not ultimately endanger any important national interest. In our opinion this statement implies the existence of a clear-cut distinction between grass mills and bamboo mills which is not supported by the evidence. The principal Indian mills to which the term " grass mills " was applied have since undertaken important developments in connection with bamboo and an increasing proportion of their output of paper will hereafter be manufactured from bamboo. As regards the mills in Upper India and Bombay, although no steps have been taken till now for the utilisation of bamboo, it would be rash to conclude, considering the widespread occurrence of bamboo in India, that these mills would be debarred permanently from using bamboo. We consider that a more correct view of the situation is that which regards the whole of the Indian Paper industry as one and bamboo as a raw material which supplements rather than competes with grass. We accept the view that the future development of the Paper industry in India depends on bamboo and that unless the development of bamboo makes progress the Indian industry will be seriously hampered. But we do not think, on the findings we have arrived at, that the development of bamboo will displace grass from its present position or that such displacement, if it comes about, will not endanger the national interest. Grass as a constituent of paper has a recognised value in the market and will continue to be used in conjunction with other materials as a necessary and valuable ingredient. Moreover the existing mills which use grass or other indigenous materials provide a potential market for bamboo and their disappearance will retard its development. And as the Tariff Board recognised in its previous report " the immediate shutting down of the mills would mean the dispersal of the workmen who have been trained during the last forty years, and the bamboo mills would have to train their workmen from the start ".

Bounties unsuitable.

88. On the view set forth in the preceding paragraph, we are precluded from suggesting any form of assistance which would have the effect of subsidising one branch of the Paper industry

leaving the other branch to look after itself. For this reason we are unable to recommend bounties as a suitable method of assistance for the Paper industry. Unless it is proposed that a bounty should be paid on every ton of paper made from indigenous materials it will be impossible to avoid making the kind of distinction we have deprecated. The provision of bounties on so large a scale is obviously not a practicable proposal. Further, there are strong administrative objections to the grant of bounties based on the use of specific kinds of materials. These are fully set out in paragraph 146 of the 1925 Report and constitute in our opinion a conclusive argument against providing assistance for the Paper industry in the shape of bounties.

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CHAPTER VII.

The Measure and Period of Protection.

The estimate based on costs of India Paper Pulp Company on bamboo.

89. In estimating the measure of protection required by the Paper industry, it must be presumed that as far as possible bamboo will be used as the chief primary material. Except for certain well recognised classes of paper for which the market is more or less limited, it is clear from what we have already stated that bamboo provides a suitable raw material for the manufacture of paper. Considering the progress already made in the development of bamboo, we should assume for the purpose of estimating the measure of protection that all but 25 per cent. of the finished output in the next few years may be based on bamboo. As we have shown in Chapter II, it will be possible for the mills ultimately to reduce the percentage of materials other than bamboo to considerably less than 25 per cent. But we do not think it reasonable to suggest that during the period of protection any lower proportion than this can in practice be attained. The India Paper Pulp Company have had longer actual experience of bamboo than other mills and their pulp plant is engaged exclusively in the manufacture of bamboo pulp. We propose therefore to take their costs for 1930-31 as the basis of our calculation.

The estimated works cost assuming 75 per cent. bamboo furnish.

90. The proportion of the various kinds of fibrous material represented in the India Paper Pulp Company's output of finished paper in 1930-31 was as follows:—

	Per cent.
Bamboo	30
Wood pulp	63
Paper cuttings	2

It is necessary to determine what adjustments in the works cost of 1930-31 will be required if the proportion of wood pulp is reduced by the use of bamboo pulp from 63 per cent. to 23 per cent. of the finished output leaving a balance of 25 per cent. for wood pulp and paper cuttings together. The total quantity of wood pulp used in the mill in 1930-31 was 4,536 tons. In order to reduce the consumption of wood pulp to 23 per cent. of the present output it would be necessary to find $4536 \times \frac{40}{63}$ or 2,880 tons of additional bamboo pulp. The works cost of bamboo pulp at Naihati in 1930-31 on a commercial air dry basis was Rs. 196·6 per ton. In estimating the works cost for the purpose of protection it is necessary to make some reductions from the figure of Rs. 196·6. Since March last the cost of bamboo per ton has declined from Rs. 44 a ton dry weight (on which the 1930-31 costs are based) to Rs. 42 a ton. This will mean an approximate reduction in the cost of bamboo pulp of Rs. 5 per ton. Another item on which immediate reduction is possible is sulphur. The sulphur consumption in 1930-31 was 6·36 cwts. per ton of dry pulp against 5·08 cwts. in 1924-25. The increase was necessary in order to eliminate bad cooks, but it is anticipated that with the improvements in equipment already provided, especially the bamboo preparing machine, the consumption may be reduced immediately to 5 cwts. This will mean a reduction in the cost of pulp of approximately Rs. 6 per ton of air dry pulp. The two reductions will amount together to Rs. 10·6 and we propose therefore to take the cost of bamboo pulp on the present output at Rs. 186 per ton air dry. This figure represents practically the cost at which imported pulp was landed at the mill in 1930-31 and no adjustment is therefore required in the final cost on account of the replacement of 2,880 tons of wood pulp by a similar quantity of bamboo pulp. It is generally admitted that the use of bamboo pulp in place of wood pulp will not involve any additional expenditure in the paper section of the mill. It has been suggested that bamboo pulp may require a little more beating, but we have ascertained that the increased cost of power on this account will not exceed 8 annas per ton of paper. On the other hand, bamboo pulp being made at the works in the shape of wet pulp will not require to be broken up as in the case of imported pulp and the saving under this head may offset the increased expenditure in beating. An adjustment is however required in the works cost of the bamboo pulp used in 1930-31 since this is entered at a works cost of Rs. 196·6 per ton. A reduction of Rs. 10·6 per ton of bamboo pulp air dry would mean the following reduction in the works expenditure of 1930-31:—

TABLE XLIX.

Total quantity of raw bamboo used in 1930-31 .		4,466	Tons.
Equivalent pulp air dry at 49 per cent. . .		2,188	„
Total reduction in cost at 10·6 per ton .	Rs.	23,193	
Reduction per ton of finished paper 23,193/6,188	„	3·7	

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The works cost per ton of paper in 1930-31 excluding freight was Rs. 330·65. Making the above reduction we get a works cost of Rs. 327 per ton of paper. This is Rs. 27 per ton higher than the figure which we estimated in paragraph 78 as the cost which the Indian mills may attain ultimately if all future economies are allowed for. In calculating the measure of protection it is fair to take into account only such economies as may reasonably be realised during the period of protection. Further economies will require a longer period of development and figures based on them may result in an inadequate measure of protection being granted to the industry. For this reason we propose to base the fair selling price for the purpose of protection on a works cost of Rs. 327 per ton.

Capital charges.

91. In calculating the overhead charges we propose to adhere to the figure of Rs. 800 which the Tariff Board adopted in 1925 as a reasonable capitalisation per ton of paper. The India Paper Pulp Company have furnished us with a detailed estimate of the replacement cost of their buildings and plant based on recent quotations. The total estimate for a mill producing a little over 6,000 tons of paper and the quantity of pulp equivalent to it is given as Rs. 49·19 lakhs which corresponds approximately to Rs. 800 a ton on their output of 6,188 tons in 1930-31. The Titaghur Paper Mills Company have given us a general estimate of Rs. 150 lakhs as the replacement value of their present plant with a capacity of 10,500 tons of pulp and 20,800 tons of paper. If additional capital expenditure is provided for erecting a pulp plant for doubling the pulp capacity and if allowance is made for the reduction in prices of machinery since 1925, we shall in this case also get an approximate figure of Rs. 800 per ton of paper.

Other charges and profit.

92. In calculating the overhead charges we propose to take depreciation at an average rate of $6\frac{1}{4}$ per cent. on the whole block, interest on working capital at $7\frac{1}{2}$ per cent. of the works cost of six months output and Managing Agency charges at 10 per cent. of the profit before depreciation is set aside. As regards working capital our estimate is somewhat lower than that adopted by the Board in 1925 which was based on the works expenditure of eight months. Our estimate corresponds more closely to the figure normally adopted by the Board in its enquiries and we see no reason in the circumstances of the Paper industry for adopting a higher figure. Our allowance for Managing Agency and Head Office charges is also lower than that accepted by the Board in 1925. We have based our figure on the amount actually spent under this head by the Titaghur Paper Mills Company. In estimating the assistance required by the industry in 1925 the Board made no allowance for profit on the ground that the evidence did not justify a definite finding as regards the claim of the industry to protection and the assistance granted was therefore limited to what was necessary to cover expenses and overhead charges. We have found in this enquiry that the industry fulfils the conditions laid down by the Fiscal Commission and is therefore entitled to protection at a rate which will ensure adequate development. We consider therefore that in accordance with the usual practice of the Board a fair allowance for profit should be made. Adopting these figures we get the following overhead charges per ton of paper:—

	Rs.
Depreciation	50
Interest on working capital	12
Managing Agency and head office charges	11
	73

To this must be added profit at 8 per cent. amounting to Rs. 64 per ton. Including the works cost the fair selling price on this calculation is:—

	Rs.
Works cost	327
Overhead charges	73
Profit	64
Per ton of paper .	464

Allegation of excessive cost in Indian mills.

93. In one of their representations the Calcutta Paper Import Association has drawn our attention to the apparently excessive spread between the cost of pulp and the final price of paper as shown in the Indian Companies' statements. The Import Association estimates that the spread between the cost of pulp and the selling price *ex*-works of a mill in England is £12 or Rs. 162 per ton of paper at the then rate of exchange. The calculation is made in the following manner. The c.i.f.c.i. price of a good quality English M. F. or S. G. printing is £27 per ton. This includes exporters' profit, Agents' commission, bank charges and interest which amount to not less than 10 per cent. in all. Export, packing, freight and insurance would cost not less than £3-6-0 leaving £21 as the mill's selling price. The price of wood pulp at the English mill is £9 per ton, leaving a spread of £12. In comparison with this it is suggested that the Indian mills' spread is excessive. We are not in a position to verify the figures of charges for an English mill on which this calculation is based. But assuming these figures to be correct, we propose to consider how far the conclusion drawn with regard to Indian mills may be accepted. For the purpose of fixing the measure of protection, we have estimated a fair selling price for Indian mills of Rs. 464 per ton of paper. This includes depreciation and profit calculated at rates which are considered suitable under the conditions prevailing in India for a reasonable development of the Paper industry. If these are excluded, the selling price will be reduced to Rs. 350. The cost of bamboo pulp is taken in this estimate at Rs. 186 which leaves a spread of Rs. 164 between the cost of pulp and the selling price excluding depreciation and profit. This almost exactly corresponds to the spread in an English mill as estimated by the Import Association. Unless it is assumed that in the present conditions of the paper market English mills are able to obtain prices which will yield them depreciation and profit on the scale we have proposed for the Indian industry, the comparison will be obviously of very little value in establishing the conclusion suggested by the Import Association. Without evidence that the prices charged by English mills at present cover all reasonable charges at normal rates it cannot be held that the position of Indian mills in this respect, even if no allowance is made for future improvements, is unreasonable in comparison with English mills.

The protective duty required on paper.

94. The usual practice of the Board in determining the measure of protection is to compare the fair selling price for the Indian industry with the landed duty free price of imported goods and take the difference as the measure of protection required. This is a method which is difficult to apply in the case of the Paper industry. The varieties of paper in the market are so numerous that it is impossible to determine the classes of imported papers which are precisely comparable with Indian made papers. For this reason the Tariff Board decided in 1925 to adopt the average realised price of the mills as a more suitable criterion for fixing the measure of protection. Whether the initiative in fixing prices is taken by the Indian mills as appeared probable in 1925 or by dealers in imported paper, it is clear that the course of prices in each case is substantially the same. It is therefore reasonable to take the realised prices of the mills as indicating the general level of prices. An incidental advantage of following this method is that it discounts the railway freight advantage enjoyed by the mills in upcountry markets, and no deduction from the fair selling price would be necessary on this account. The average realised price of the India Paper Pulp Company in 1930-31 was 3 annas 4·40 pies *ex*-mill. Since almost the whole of their output during the year was writing and printing paper with the exception of wrapping paper made for use in the mills, this price may be taken as the average realised price of the mills for protected papers. The prices of 1930-31 however reflect so largely the present general depression in commodity prices as to render them unsuitable, without some adjustment, as a basis for protection. The average realised price of the Company in 1928-29 was 3 annas 6·11 pies. A figure intermediate between the price of 1928-29 and those of 1930-31 will in our opinion be a more appropriate basis for a scheme of protection which is intended to operate for a period of years. Accordingly we propose to take an average realised price of 3 annas 5·25 pies. We have already referred to the fact that since October last the principal European pulp mills on the Continent have agreed to adopt a policy of restriction of output, at first by 15 per cent. and subsequently by a further 15 per cent. The effect of this on paper will be a slight hardening of prices, a tendency which will be assisted by the prolonged labour strike in Norwegian mills. The following figures of prices supplied to us by Messrs. John Dickinson and Company appear to illustrate this tendency.

	Unglazed news.
	£ s. d.
29th January 1931	12 17 6
12th February 1931	13 0 0
18th July 1931	13 10 0

The East Indian Railway has notified the Companies of its intention to raise the special freight rates now granted to the mills.

The India Paper Pulp Company have estimated that if the new rates proposed by the East Indian Railway were adopted by all the railways concerned the effect would be to reduce the freight advantage by not more than Rs. 3-8 per ton of paper. Similar estimates have been supplied also by the other Companies. We therefore consider that the effect of this on realised prices will be negligible. An average price of 3 annas 5·25 pies per lb. is equivalent to a duty free price of Rs. 341 per ton. The estimated fair selling price is Rs. 464. The measure of protection required is the difference between these two, *viz.*, Rs. 123 per ton of paper.

The works cost of bamboo pulp.

95. We have proposed in Chapter VI that a duty should be levied on imported wood pulp. We have estimated the present works cost of bamboo pulp at the Naihati mill for the purpose of protection at Rs. 186 per ton of air dry pulp. The cost of bamboo pulp in 1930-31 on approximately the same output at the Kankinara mill of the Titaghur Paper Mills Company was Rs. 183·64 per ton air dry. Unlike the Naihati mill, in which the magnesite acid process is adopted, the Kankinara mill employs the alkali process based on pure caustic soda. The lower cost at Kankinara as compared with the cost at Naihati is not however due to any economies which have resulted from the alkali process but to the lower price at which bamboo was obtained in 1930-31. The average cost of bamboo per ton at Kankinara during the year was Rs. 30 per ton air dry equivalent to approximately Rs. 33-8 bone dry. Half the supply was obtained from the Angul Reserve at Rs. 38 and the other half from local contractors at Rs. 22. The cost of bamboo on which our estimated works cost at Naihati is based is Rs. 42 per ton bone dry. The lower cost of bamboo at Kankinara represents an advantage in works cost of about Rs. 20 per ton of pulp. Thus it will be seen that on the manufacturing costs excluding bamboo the Kankinara figure exceeds the estimated Naihati cost by about Rs. 17 per ton of pulp. While we consider that a gradual reduction in the cost of bamboo is probable as compared with the figure we have assumed for Naihati, namely Rs. 42, it would not be reasonable to accept for the present a figure approximating to the average price at which bamboo was obtained at Kankinara in 1930-31. The possibilities of the Angul Reserve as a steady source for large supplies of bamboo at the present cost, especially from the point of view of labour and transport facilities, have yet to be proved. The present cost of bamboo drawn from the Angul reserve is Rs. 38 air dry which corresponds to the figure on which our estimated works cost is based. Moreover, it is probable that without further organisation difficulties would be experienced in the earlier stages in obtaining steady supplies of bamboo in larger quantities from local contractors at the low prices which prevailed in 1930-31. We therefore consider that the figure we have estimated for Naihati, *viz.*, Rs. 186 should be regarded under present condition as a reasonable estimate of the works cost of bamboo pulp. Commercial imported pulp is also sold on an air dry basis and the figure of Rs. 186 will therefore be the correct one to take for purposes of comparison.

The protective duty required on imported wood pulp.

96. In estimating the fair selling price of bamboo pulp for the purpose of determining the rate of duty on wood pulp it is unnecessary to take depreciation and interest charges into account. In our estimate of the overhead expenditure required for a paper mill we have allowed a capitalisation sufficient for a paper mill producing a quantity of pulp equivalent to its full capacity for paper. The object of the duty is to make it worth while for a paper mill to manufacture the pulp it requires from bamboo rather than to import pulp. Hence so long as the total overhead charges are covered by the protective duty on paper, the works cost of bamboo pulp may be taken as the criterion for fixing the duty on wood pulp. The most recent quotation for easy bleaching sulphite pulp (to which the bamboo pulp manufactured at Naihati corresponds in quality) is £10-10 c.i.f. Calcutta. This is Scandinavian pulp. Lower quotations for small consignments from America have been received recently, indicating a difference of slightly over £1. We are informed that American pulp is inferior in quality and so far has been represented only by small consignments. Since American manufacturers are not a party to the scheme of restriction adopted by European pulp manufacturers it must be presumed that if American pulp is imported in larger quantities a further decline may occur in the price of imported wood pulp. We propose therefore to take an average figure of £10 c.i.f. Calcutta as representing the price of easy bleaching sulphite pulp. Taking landing and transport charges at Rs. 6, we get an approximate price of Rs. 140 per ton of pulp delivered at mill. The difference between this and the estimated works cost of bamboo pulp is Rs. 46. We propose that the duty on imported wood pulp should be fixed at Rs. 45 per ton.

Compensatory duty on paper necessary.

97. It is necessary that sufficient time should be allowed to the mills to organise their supplies of bamboo and adapt and develop their pulp plant so as to produce bamboo pulp on the scale we contemplate. In the meantime we think it desirable that the mills should be compensated for the increased cost of wood pulp resulting from the duty. The Indian mills were generally agreeable to the imposition of a duty on imported pulp if allowance for the increased cost were made in calculating the duty on paper. The Paper Import and Traders' Associations were also prepared to agree to protection if a duty were levied on imported pulp. The total quantity of wood pulp imported into India in 1930-31 was 22,715 tons which is equivalent to nearly 20,000 tons of paper. The total output of paper by the Indian mills in 1930-31 was about 40,000 tons which gives an average proportion of imported pulp of 50 per cent. of the present production of paper. We think that by the end of the period of protection this should be reduced to not more than 25 per cent. The average proportion of finished paper represented by wood pulp during the period of protection would therefore be 37½ per cent. We have proposed a duty on imported pulp of Rs. 45 per ton. This would amount per ton of finished paper to Rs. $45 \times \frac{100}{86}$ = Rs. 52·3. The increased cost of

paper per ton on the whole output as the result of the duty will be 37½ per cent. of Rs. 52·3 = Rs. 19·6. The total duty required on paper will then be Rs. 123 *plus* Rs. 19·6 = Rs. 142·6 per ton. On the portion of the finished paper represented by the percentage of wood pulp we have allowed there will be some economy resulting from the addition to the weight of paper by the use of China clay for loading. Allowing for this we consider that a duty of Rs. 140 per ton will be sufficient. We recommend therefore that the present protective duty of one anna per lb. equivalent to Rs. 140 per ton should be continued.

The mills which cannot obtain bamboo pulp.

98. We have been at some pains to ascertain whether the imposition of a duty on imported pulp at the rate we have proposed will impose an unfair burden on the mills which are not at present in a position to replace wood pulp by bamboo pulp. We have proposed a duty of Rs. 45 a ton on imported pulp. In order to compensate manufacturers of paper we have also proposed an addition to the estimated protective duty on paper, assuming an average consumption of imported pulp amounting to 37½ per cent. of the output of paper. If, therefore, the consumption of imported pulp does not exceed this proportion, the extra duty on paper will be sufficient to cover the additional cost involved by the duty on imported pulp. We find from figures supplied to us by the Upper India Couper Paper Mills Company at Lucknow that the total output of paper in 1930 was 2,600 tons. Of this the quantity represented by imported pulp was 305 tons or under 12 per cent. This is so far below the average percentage of wood pulp which under our proposals can be used without additional cost that it is obvious that no hardship will be caused to the Lucknow mills by a duty on imported pulp. It was however contended by the representatives of the mills that if the price of imported pulp was raised by means of a duty the Company would be more dependent on grass for making better qualities of paper and this might lead contractors who supply grass to demand higher prices. As a matter of fact the price at which the Company now obtain their grass is Rs. 41 per ton which is considerably lower than the present cost of grass to the mills in Bengal. Under our proposals the percentage of wood pulp which the Company might use on an average without incurring any loss on account of the import duty is 37½ per cent. of the finished output while their present consumption is less than 12 per cent. The other Company who are not in a position to use bamboo pulp at present are the Deccan Paper Mills Company of Poona. Their total production of paper in 1929-30 was 2,124 tons and in 1930-31, 2,190 tons. The quantity of imported pulp used in these years was 740 tons and 1,160 tons respectively, representing, on the yield obtained at the mills, 627 and 983 tons of paper or 30 per cent. and 45 per cent. respectively of the total output of paper. The average of the past two years thus corresponds closely to the percentage adopted in our proposals. The Company's output of white paper in 1930-31 was only 600 tons and it is evident that they must have used considerable quantities of imported pulp in the manufacture of papers of inferior quality

for which other materials would have been equally suitable. It was stated by the Company's representative in evidence that it was their intention to increase the total output to 4,000 tons for which the mills have sufficient capacity as equipped at present. If this increase in output was undertaken, it would be almost entirely in respect of white printings and writings. The indigenous materials now used, namely waste paper and rags, would be unsuitable except in small proportions for this class of paper and consequently a larger quantity of imported wood pulp would be required. We have carefully examined the position of the Company and we are satisfied that our proposals will not inflict any hardship on the Company even if a very large increase in the production of white papers is undertaken during the next few years. The present output of paper in the mills is about 2,200 tons of which about 600 tons is white paper. If the output is increased to 4,000 tons and the whole increase consists of white paper, the total output of white paper will be 2,400 tons. If we assume that this paper consists of 10 per cent. loading, 30 per cent. other materials and 60 per cent. wood pulp—which in the circumstances is a reasonable assumption—the output of white paper represented by wood pulp will be about 1,400 tons. If white paper is excluded, the rest of the Company's output is composed almost entirely of ordinary Badami and Wrappings for which imported pulp is not required. There will be no difficulty whatever in obtaining larger quantities of waste paper and rags as the Company can double their existing supplies at more or less present prices. It follows, therefore, that even if the total production of the Company is increased to 4,000 tons, the production can be so arranged that no more wood pulp will be required than is represented by 1,400 tons of paper. This on a total output of 4,000 tons is 35 per cent. which is below the percentage of wood pulp of which our proposals admit the use without additional cost.

Continued protection proposed for seven years.

99. Taking all the circumstances into account we consider that the period for which protection is to continue should be fixed at seven years. In their applications for the continuance of protection, the paper Companies have proposed that protection should be continued for periods varying from ten to fifteen years. While we are of opinion that the period suggested by the Companies is too long, we think that in view of the difficulties of technique, organisation and machinery which have come to light in connection with the manufacture of paper from bamboo, a period short of seven years will prove inadequate. We believe that, with the assistance which we recommend, a period of seven years will afford the industry opportunity to consolidate its position and encouragement to undertake further schemes of expansion.

CHAPTER VIII.
Supplementary Proposals.

Exclusion of newsprint from the protective duties.

100. At present printing paper containing not less than 65 per cent. mechanical wood pulp calculated on the fibre content is excluded from the scope of the protective duties. In the present enquiry the mills have almost unanimously asked that the percentage should be raised to 75 per cent. They argue in the first place that their proposal would in effect restore the original limit of 65 per cent. calculated on the total weight which was in force prior to 1927. This question was fully investigated by the Tariff Board in 1927 and no new reasons have been adduced before us to justify a reconsideration of the decision then reached. The mills further complain that advantage has been taken of the exclusion of newsprint to import cheap printing paper which is not newsprint at all, so as to capture the market which should rightly be held by the lower grades of paper, such as badamis, manufactured in India. The import figures for "printing paper other than newsprint—not protected" are as follows:—

	Tons.
1924-25 (before protection)	11,735
1925-26 (part before and part after protection) .	6,357
1926-27	1,750
1927-28	4,086
1928-29	9,463
1929-30	7,817
1930-31	6,011

It is true therefore that at present over 6,000 tons of printing paper other than newsprint enter the country after paying the revenue duty only. But a substantial proportion of this is cheap paper with which the Indian mills would find it difficult or impossible to compete even with a protective duty. The mills have made a further suggestion that those newspapers which require better class newsprint in order to maintain their present standard should be permitted to import such amount as they require under licence and cited before us a number of cases of the smaller Indian newspapers which apparently would not be affected by the change from 65 per cent. to 75 per cent. The leading English and Indian newspapers have entered very definite protests before us regarding the proposal to alter the percentage. They state that the average proportion of mechanical wood pulp in the paper they use is below 75 per cent. of the fibre content and that the suggestion of the mills would affect them seriously. It appears to us that the complaint of the mills is based largely upon a misconception of the primary objects which the Board had in view in framing its recommendations in 1925. The mills assume that the intention was to avoid affecting the price of the ordinary newspaper in India. It is true that the Board recognised that the existence of a cheap newspaper press depended upon unhampered supplies of paper containing a high percentage of mechanical wood pulp but the ground for the exclusion of this class of paper from the protective scheme was primarily that the mills in India could not manufacture it at competitive prices. We do not consider that the exclusion from the protective duty of printing paper containing not less than 65 per cent. mechanical wood pulp calculated on the fibre content has caused any serious harm to the Indian industry. Unless there was evidence that the object of the Protection Act was seriously defeated by the present ruling we should consider it undesirable to make any changes. On the facts as disclosed in this enquiry we are unable to find that the interests of the Indian industry are seriously jeopardised by the existing arrangement.

The complaints of the importers.

101. The Calcutta Paper Import Association complains of the methods adopted for the determination of the percentage of mechanical wood pulp. They state that the chemical analysis of pulp and paper is a matter of great difficulty involving many complications and they challenge the competency of the Customs Department to arrive at sufficiently accurate results. So far as the difficulties of chemical analysis are concerned we are obviously not in a position to offer any expert criticism. The Customs Department admit that the phloroglucinol method of ascertaining fibre content originally adopted did not give satisfactory results as no allowance was made for the density or weight factor of the particular type of fibre under examination. That method has now been abandoned in favour of the Spence and Krauss method and it is stated by the Customs Department that the number of contested cases has been greatly reduced and that with the 5 per cent. margin of error allowed there is no reasonable cause for complaint. The importers admit the improvement in method but state that they had no information when the change was introduced and that they cannot tell when further changes may not be made without any information being given to the trade. The importers also complain of the assessment of certain classes of paper such as machine glazed pressings to the protective rate of duty. Several classes of paper* were specifically mentioned by the Calcutta Paper Import Association in their evidence before us as being subject to the protective duty which in their opinion were not writing or printing papers and should therefore pay only the revenue duty. On enquiry it appears to us that some misunderstandings have arisen as to the ordinary usage of trade descriptions and as to the interpretation of the Act. We consider that, if our proposals are accepted, steps should be taken at the earliest possible opportunity after the passing of the Act by conference between the various interests concerned to specify as definitely as may be the

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* The classes of paper particularly mentioned by the Calcutta Paper Import Association are as follows:—

Unglazed coloured News, White News, Cartridge paper, Glazed coloured Printings, M. G. Wrappings.

classes of paper which are by ordinary trade usage included in the term "Printing and Writing Paper" as used in Articles 155 and 156 of the Tariff Schedule.

Packing paper excluded from the protective scheme.

102. It has been urged before us that some change is required in the present protective scheme with regard to packing paper, which includes the qualities known as Kraft and Imitation Kraft. We have not received any satisfactory indication of the amount of this class of paper now made in India. The total wrapping paper produced by the mills in 1930-31 amounted to nearly 2,000 tons of which 1,550 tons was manufactured by the Bengal Paper Mill Company. As we have shown in paragraph 11 this Company find it economical to use all their waste material and their sales of wrapping paper amounted in 1930-31 to something like 1,100 tons. In oral evidence they stated that it was difficult to analyse the different kinds of packing paper imported into India but they estimated that of the 11,000—12,000 tons imported approximately two-thirds could be produced in India from indigenous fibres. It is true that the Andhra Paper Mills Company claim that they have special equipment for the manufacture of boards and packing paper but no paper of this class has so far been produced. All the other mills practically confine their output of wrapping paper to their own requirements. In the absence of any definite statistics the suggestion has been made by the Titaghur Paper Mills Company and the Bengal Paper Mill Company that the Executive should take power to include packing paper in the protective scheme when it is shown to the satisfaction of the Government of India that these classes of paper are actually being produced in India. Although the India Paper Pulp Company have made no proposals they have stated that such paper can be produced from bamboo and other indigenous fibres. As has been stated we have no direct evidence on this point but from the views expressed regarding the possibilities of bamboo both by mills and by the Forest Research Institute at Dehra Dun we are inclined to the view that there is no inherent impossibility in the production of Kraft papers from bamboo pulp. This however we cannot regard as sufficient justification for extending protection to such papers. In the first place we have no information regarding the price at which such paper could be produced in India and we are not therefore in a position to estimate with any accuracy the measure of assistance which may be required. But there is another aspect of this question which we regard as even more important. The larger mills are now all working to full capacity and finding a steady market for their output and sufficient room exists for a steady expansion of that market. We have referred in Chapter V to certain points in which in our opinion the Indian mills still fall short of the efficiency which they should attain. We consider that it will be more to their advantage to consolidate the position which they have reached and turn their attention to improvements in methods and machinery than to attempt to expand their production at the risk of impairing their efficiency. We have therefore no recommendation to make with regard to packing paper

and propose no change in the existing Tariff Schedule so far as this class of paper is concerned.

The Tariff Schedule.

103. Under our proposals there will be a duty of Rs. 45 a ton on wood pulp. Otherwise our recommendations involve no alteration in the Tariff Schedule. Printing paper in which the mechanical wood pulp amounts to not less than 65 per cent. of the fibre content, and packing and wrapping papers will for reasons which we have stated continue liable to the revenue duty; and so will chrome, marble, flint, poster and stereo papers, regarding which no representation has been made to us. Other printing paper will be liable to the protective duty of one anna a lb. As regards writing paper, ruled or printed forms (including letter paper with printed headings) and account and manuscript books and the binding thereof will be liable to the protective duty of one anna a lb. or the revenue duty whichever is higher; all other sorts of writing paper will be liable to the protective duty.

Conditions stated in para. 292 of the Fiscal Commission's Report.

104. We have in the past drawn attention repeatedly in our reports to the importance of emphasizing the Indian character of the industries which receive protection. The Indian Fiscal Commission in paragraph 292 of their Report stated that it would be reasonable to insist, where concessions are granted by Government or where the taxpayers' money is devoted to the stimulation of an enterprise, (1) that the companies enjoying such concessions should be incorporated and registered in India with rupee capital, (2) that there should be a reasonable proportion of Indian Directors on the Board and (3) that reasonable facilities should be offered for the training of Indian apprentices. That this is the settled policy of the Government of India is evident from the declaration made on their behalf in the Legislative Assembly on March 2nd, 1922 in connection with the grant proposed for the rehabilitation of railways. Whenever assistance is granted to industries by means of bounties or subsidies, these conditions are now laid down as essential conditions which must be satisfied before an industry can claim assistance. Apart from practical considerations of administration, there can in reality be no distinction in this regard between industries receiving assistance in the shape of bounties or subsidies and those which are protected by means of import duties. It is therefore important, from the national point of view, that in the case of every industry which claims protection this aspect of the case should be fully examined.

India Paper Pulp Company to be registered as a public company.

105. The first condition, namely, that the companies concerned should be incorporated and registered in India with rupee capital is obviously intended as a means of securing for Indian investors reasonable opportunities of participating in the benefits of protection. This is rendered impossible if companies are registered as private companies. It is therefore necessary to point out that the India Paper Pulp Company which is one of the principal Companies engaged in the Paper industry in India is still a private

company. We have already mentioned in Chapter I that this was one of the grounds on which the Government rejected the proposal to grant direct capital assistance to this Company in 1925. It was stated by the Company during the enquiry in 1924 that it was intended to make the Company into a public one as soon as the future of the concern was reasonably assured. The financial position of the Company at present is that although they have not yet declared any dividends, they have since 1924-25 written off depreciation to the extent of Rs. 20 lakhs, have reduced their overdraft by Rs. 14 lakhs and have repaid a sum of Rs. 3 lakhs out of a loan of Rs. 10 lakhs borrowed for capital extensions, besides paying interest on it at 6½ per cent. If it is decided to continue protection, the Company's position on these facts should be held strong enough to justify their conversion into a public company. We consider, therefore, that at the earliest opportunity the Company should take steps to register themselves as a public company. If the appeal for public subscription of shares fails, the Company having offered the Indian investor adequate opportunities of participation will have sufficiently discharged their obligation under the scheme of protection. We believe it would be in the interest of the Company themselves, by taking steps in this direction, to be identified more closely with Indian interests.

Indianisation of directorate and staff.

106. The second and third conditions may be conveniently discussed together. As regards the Upper India Couper Paper Mills Company, the Deccan Paper Mills Company and the Andhra Paper Mills Company, the directorates are entirely Indian. The Titaghur Paper Mills Company had three Indian Directors on the Board in 1924 while at present four out of the seven Directors are Indians. The Bengal Paper Mill Company had one Indian and three British Directors in 1924 and now have one Indian and four British Directors. The proportion of Indian directorate in this Company is therefore lower now than in 1924. The India Paper Pulp Company being a private Company, this question does not arise in their case at present. With regard to the question of Indianisation of the superior staff, although some progress has been made since 1924-25, the position cannot yet be regarded as satisfactory. The Upper India Couper Paper Mills had three Europeans on their superior staff in 1923-24 but have none now. The superior management of the Poona mills is also entirely in Indian hands. At Rajahmundry there is one European expert but the General Manager and the rest of the staff are Indians. But as the Tariff Board pointed out in 1925 " it is the progress of Indianisation in the larger mills that is important ". The results attained by these mills were regarded by the Board as unsatisfactory and they therefore devoted a good deal of attention to the subject in their Report. Since 1924 appreciable progress has been made only in the mills belonging to the Titaghur Paper Mills Company, although even there there is considerable room for further progress. In 1923-24 there were no Indians holding any superior position on the staff of the Company's mills. In 1924 the Company instituted an apprenticeship scheme under which 24 young men have so far been

admitted into the mills as apprentices. Of these, however, only 10 are now employed in the works. About these men the Company state " they are making satisfactory progress in their studies and training, so much so that it is to be expected that certain men will be able to take the place of certain Europeans at present indentured to us on the completion of the latter's agreements ". One of the apprentices who has just finished his time is acting as Chief Finisher at the Titaghur mill in the absence of the European in charge of the Finishing Department. At the Kankinara mill the second Finisher is also one of the apprentices and has just displaced a European. Most of the Indians, however, who are at present holding superior positions are employed in the Chemical, Engineering, Sales and Medical sides of the establishment. In these departments there are at present six Indians who receive monthly salaries between Rs. 250 and Rs. 600. In the paper making sections no progress has been made in the replacement of Europeans by Indians and the Company state that they are not confident that the apprentices are capable of displacing the European supervisors. This appears to us to be a most disappointing aspect of the situation and to call for careful investigation. In the Bengal Paper Mill Company the European Chemist has been displaced by an Indian, but apart from this there are no Indians in the superior management of the mill. The Company have at present 23 men working as apprentices, 7 in the electrical department, 6 in the paper making department and 10 in the engineering shops some of whom have served for over 18 months and are regarded by the Company as the best Indian young men they have recruited. At the India Paper Pulp Company's mill at Naihati there were four Europeans in 1924 while at present there are five. The increase is attributed to the installation of a second paper machine for which additional expert supervision was required. In 1929 an Indian apprentice was appointed on a five year agreement and another was similarly appointed in 1930. The period of training is divided over various sections of the mill. On the completion of the term, the apprentice binds himself to work for the Company for a further period of five years on a salary of Rs. 200 per month rising to Rs. 400 in the fifth year.

Training of apprentices.

107. On a review of the facts stated in the foregoing paragraph we find that, of the three Companies in Bengal, the least satisfactory record in this respect is that of the Bengal Paper Mill Company. This Company have been in existence now for over forty years and during this long period appear to have made no progress whatsoever in associating Indians with the direction and superior management of their mill. We call special attention to this fact because we consider that the Company's record betrays a serious disregard of their obligations as an important unit in an industry receiving public assistance. As regards the other two Companies, while we acknowledge the efforts which have been made in this direction, particularly by the Titaghur Paper Mills Company, we desire to emphasise that unless further progress is made in the near future, they cannot be regarded as fulfilling sub-

stantially the conditions which underlie the grant of protection. It will be seen from paragraph 106 that it is in the most important section of the mills, namely the paper making department, that no progress has so far been reported. The explanation of the mills is that there is great difficulty in securing the right type of Indians because of the fact that the work of paper making is arduous and makes considerable demands on the stamina and endurance of the young men engaged on it so that most of them do not remain to complete the period of apprenticeship. In the course of the Tariff Board's enquiries, covering a wide range of industries having essentially different characteristics, this argument has been adopted so frequently by employers that we are unable to accept it as a convincing explanation. The truth is that the inherent incapacity of educated Indian youths for industrial jobs is an assumption which is too readily resorted to by the less progressive class of employers in India as an excuse for a policy of inertia and undue conservatism. We have seen Indian apprentices at work in the mills we have visited and have been favourably impressed by their bearing and general attitude. Indeed the mills themselves have expressed strong approval of the Indian apprentices who are at present in the mills. We are not satisfied that sufficient thought has been paid to such questions as the system of recruitment and training of apprentices and the conditions of work provided for them, the period of apprenticeship required for men already possessing advanced technical qualifications and experience in European countries, and the stimulus to good work resulting from the guarantee of employment on suitable remuneration based partly on bonuses of the kind now given to covenanted European employees. It is to be regretted that the proposal made by the Tariff Board in 1925 for a concerted scheme of training Indians has not yet been adopted, and we consider it most important that the mills should lose no further time in combining to carry out these suggestions.

Measures to enforce observance of conditions.

108. As we have already pointed out, there is essentially no distinction, as regards the applicability of the conditions mentioned in paragraph 292 of the Fiscal Commission's Report, between industries which receive assistance in the shape of bounties and industries which are assisted by means of import duties. Since, however, it is impossible to withhold the benefit of an import duty from Companies which do not fulfil the conditions, their enforcement becomes a matter of difficulty where assistance is given in the form of import duties. The Board has been faced by this difficulty in other enquiries and it is therefore relevant to quote what it said on the question in its recent report on the Sugar industry. "Compliance with these conditions should be secured by such means as Government may consider practicable in the circumstances of the Sugar industry. Though we have not recommended assistance by means of bounties to sugar Companies, it appears possible that in the future, as has occasionally occurred in the past, subsidies or loans may be granted to sugar Companies either for the development or stabilisation of their business or for research purposes. Further it has been suggested that grants should be made

by the Imperial Council of Agricultural Research for development and research work to an approved Association of Manufacturers in Northern India, while occasions may occur in which Government is prepared to offer facilities to a new Company for the acquisition of new land. In making any such grant, subsidy, loan or concession we would recommend that a condition precedent should be the observance by the Company concerned or the members of the Association of the principles laid down in paragraph 292 of the Fiscal Commission's Report " (Paragraph 105). The general lines on which this recommendation is conceived are equally applicable to the Paper industry. Concessions for the exploitation of forest areas containing bamboo or grass are already held by paper Companies or may be sought hereafter. We consider that the co-operation of Provincial Governments should be invited in securing suitable guarantees before any such lease is granted or renewed and in exercising all their powers including those of terminating the lease to ensure the observance of these conditions. Further, the Controller of Printing and Stationery now purchases annually nearly 10,000 tons of paper, equivalent to a fourth of the Indian production. If, within a reasonable time from the passing of the Protection Act, it is found that any of the Companies have failed, in the opinion of the Government, to make suitable progress in complying with these conditions, Government patronage should be withheld. Finally we believe that one of the most effective means of enforcing these conditions would be to ensure public scrutiny of the progress made by each Company from time to time. For this purpose we recommend that the paper Companies should be required to submit periodical statements to the Government embodying the progress made by them as regards each of the conditions laid down in paragraph 292 of the Fiscal Commission's Report. These statements should be placed before both Houses of the Legislature so as to ensure sufficient public scrutiny. Any Company which refuses to submit the statements called for should be penalised by either of the two methods already mentioned or by such other means as Government may decide.

Future development of Paper Pulp Section at Dehra Dun.

109. Although the development of bamboo as a raw material for the Paper industry may now be regarded as having passed the pioneering stage, we have been impressed in the course of our investigations with the need for further exploratory work in several directions and for the co-ordination of results attained by individual mills. Both in the mechanical and in the chemical sections of the manufacture of pulp there is still wide scope for co-ordinated work in the shape of experiments and research. The present practice of the mills of carrying out individual investigations without mutual collaboration partly accounts for the slow progress in achieving a suitable method of crushing bamboo. Similarly in the process of digestion the results attained in different mills by the overhead and fractional methods and by the soda, sulphate and acid methods might have been employed more effectively to the general advantage of the industry if some means of co-ordination had been in existence. The unwillingness

of the mills to disclose information to one another is natural. But this is an attitude which progressive industries in other parts of the world are rapidly discarding in consideration of the general advantages resulting from co-operation in such matters as research. After an enquiry by the Tariff Board, in which every Company has explained its position publicly in detail, there appears to be little justification for continuing this traditional attitude of secrecy. In our opinion the Paper Pulp Section of the Forest Research Institute at Dehra Dun affords a suitable means of bringing about the co-ordination we have in view. The general lines of work adopted at the Institute were laid down under Mr. Raitt's expert direction and satisfactory progress in the work of the section has been maintained since his departure by his successor who was trained under him and by the Forest Economist who is in charge of the Department. We derived much assistance in our enquiry from these officers and we consider that if provision is made for developing the work of the section and especially for providing more continuous contact between the Institute and the paper Companies, the progress of the industry will be hastened. The mills in the course of their evidence acknowledged the usefulness of the Institute and the assistance derived by them from its work. The publications issued periodically by the Institute containing the results of its work have also been of considerable interest to the commercial community. We recommend that, if our proposals for the continuance of protection are accepted, the Government should take steps to develop the Paper Pulp Section of the Forest Research Institute on the lines we have indicated.

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CHAPTER IX.

Summary of Findings and Recommendations.

(1) The total consumption of paper of all kinds in India (including pasteboard) increased from 111,963 tons in 1924-25 to 175,627 tons in 1929-30. In 1930-31 the figure fell to 154,277 tons. Of this total consumption the Indian mills have steadily supplied from 22 to 25 per cent. The consumption of protected classes of paper increased from 43,331 tons in 1924-25 to 53,584 in 1929-30. In 1930-31 the figure fell to 49,046 tons. Of these classes of paper the Indian mills have supplied from 53 to 71 per cent.

(2) There are now 9 paper mills working in India of which two belong to the Titaghur Paper Mills Company and two to the Deccan Paper Mills Company. The total capacity of the Indian mills in 1930-31 was about 45,000 tons of paper and the total output nearly 40,000 tons.

(3) There has been a considerable increase in the use of indigenous auxiliary materials. Most auxiliary materials can now be obtained in India at economical prices.

(4) There has been a large increase in the use of imported wood pulp by Indian mills. This has been of assistance to the mills in finding the surplus funds required for experiments and improvements in connection with bamboo pulp. The increase in the use of wood pulp is to be accounted for partly by the fact that the financial assistance proposed by the Tariff Board for the development of bamboo was not granted and partly by the fall in the price of wood pulp. The increased use of imported pulp has meant an expenditure of some Rs. 20 lakhs annually on Indian materials and labour which would otherwise have been spent on imported paper. In spite of the present overproduction of wood pulp, a shortage of timber for pulping and a consequent rise in the price of pulp seem likely but it is impossible to forecast when this may occur.

(5) The additional market for paper in India which the Indian mills may expect to capture is about 20,000 tons a year, excluding any normal increase in consumption.

(6) The prices of both pulp and paper have fallen considerably since 1924-25. Judging by the figures of values given in the Trade Returns, the fall in the price of pulp appears to be proportionately greater. The Tariff Board estimated in 1925 that with the protective duty the Indian mills would realise an average price of about 4 annas per pound. The actual realised price since 1924-25 has however been less than 3 annas 6 pies per pound. Although the mills have reduced their works costs below the level anticipated in 1925, the surplus of realised prices over works costs has been less than the figure estimated by the Tariff Board as a reasonable margin.

(7) There are ample supplies of bamboo available in India and Burma not only to supply the whole Indian demand for pulp but also to develop a large export trade. Bamboo which in 1924-25 cost about Rs. 55 a ton is now obtained normally at prices varying from Rs. 38 to Rs. 40 a ton air dry. Considerably lower prices are sometimes quoted for bamboo supplied by local contractors.

(8) The satisfactory mechanical treatment of bamboo under mill conditions has presented much greater difficulties than appeared probable at the last enquiry. Very considerable progress has been made with it and further experiments are being undertaken. It is these difficulties which have largely been responsible for the delay in the development of bamboo as a pulp making material.

(9) The digestion of bamboo is carried out by the acid process at the India Paper Pulp Company's mill at Naihati and by the alkali process at the other mills. The alkali process is applied in a variety of ways but generally the fractional principle of digestion is adopted. On the results obtained so far, it is impossible to say definitely whether the acid or the alkali process is more suitable for the treatment of bamboo. The mills have substantially improved the technique of these processes and have made considerable extensions and improvements to the plant. The total expenditure on additions and improvements since 1925 amounts to Rs. 47 lakhs of which Rs. 13 lakhs have been spent in connection with bamboo pulp.

(10) The quality of paper made from bamboo is proved satisfactory for most purposes. The opinion expressed by the Tariff Board in 1925 is confirmed by independent expert testimony.

(11) On an examination of the costs of production in 1924-25 and in 1930-31 it is found that, apart from the advantages due to the use of imported pulp and the fall in the price of coal and other materials, substantial reductions in costs have been achieved by improved practice and methods of working. There has been a marked reduction in the consumption of coal and of auxiliary materials and an increase in the yield obtained from primary materials. At the same time there has been a remarkable improvement in the quality of the papers manufactured.

(12) The evidence received during the present enquiry has confirmed the findings of the Tariff Board in 1925 regarding the possibilities of bamboo and grass as raw materials for the Paper industry. The future of the Indian Paper industry depends on the exploitation and development of bamboo, and it may reasonably be expected that paper made from bamboo will eventually be able to dispense with protection. Although the future expansion of the industry will be based mainly on bamboo, grass also occupies a recognised place in it and for this reason no distinction should be made between the two in the application of proposals for assistance.

(13) The Paper industry satisfies the conditions laid down by the Fiscal Commission.

(14) The withdrawal of the protective duty at the present time would inevitably lead to the disappearance of bamboo as a paper

making material. In view of the proved possibilities of bamboo and the anticipations regarding a shortage of wood pulp, it must be held that the disappearance of bamboo will be a national loss. Apart from its effect on bamboo, it is found on an examination of the financial position of the Indian mills that the withdrawal of the protective duty would seriously cripple their resources and endanger their continued existence.

(15) In order to further the development of bamboo it is necessary to offer a direct incentive for the manufacture of bamboo pulp, especially in view of the fall in prices of imported pulp. The most suitable form in which direct encouragement may be offered is a duty on imported pulp.

(16) For the purpose of determining the rate at which the protective duty on paper should be continued, a fair selling price for Indian mills of Rs. 464 per ton of paper is estimated. The price likely to be realised by the Indian Mills without duty is estimated at Rs. 341 per ton. On these figures the measure of protection required is Rs. 123 per ton.

(17) The duty on imported pulp should be fixed at Rs. 45 per ton which is approximately the difference between the works cost of bamboo pulp and the current price of imported pulp. Assuming that at the end of the protective period no more than 25 per cent. of imported pulp in terms of paper would be used, the increase in the cost of manufacturing paper would be about Rs. 19 per ton. In order to compensate manufacturers for this increased cost, the duty on paper should be continued at the present rate of Rs. 140 per ton or one anna per pound.

(18) The duties on paper and on imported pulp should remain in force for a period of seven years.

(19) The duty on paper should be applied to printing and writing papers which are now liable to the protective duty. The definition of papers which may be classified as printing and writing papers according to trade usage should be examined by conference with representatives of all the interests concerned. No alteration should be made in the existing tariff entries regarding newsprint and packing paper should remain subject to the revenue duty.

(20) The duty on imported pulp under these proposals will not inflict any hardship on the Upper India Couper Paper Mills Company and the Deccan Paper Mills Company which are not at present in a position to use bamboo pulp.

(21) The India Paper Pulp Company should take immediate steps to form themselves into a public registered Company.

(22) Although some progress has been made with Indianisation of staff and with apprenticeship schemes, it is found that the principal mills have not made the necessary efforts to attract and offer employment to Indians especially in the paper making section of the works. This matter should receive their early attention.

(23) The adoption of the principles relating to Indianisation and allied matters which are laid down in paragraph 292 of the

Fiscal Commission's Report should be made a condition precedent to the grant of concessions for exploitation of forests and to purchases of paper by Government. Periodical statements showing the progress made in this respect should be submitted by the mills for the information of Government. These statements should be placed before the Legislature.

(24) Steps should be taken to develop the Paper Pulp Section of the Forest Research Institute, Dehra Dun, with the object of co-ordinating the experimental work done by the mills.

J. MATTHAI,
President.

FAZAL IBRAHIM RAHIMTOOLA,
Member.

G. T. BOAG,
Member.

G. S. BOZMAN,
Secretary.

15th October, 1931.

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APPENDIX I.

Statement showing quantity of finished paper and percentage of output represented by various materials.

———	Bamboo.	Per cent.	Grass.	Per cent.	Other materials.	Per cent.	Wood pulp.	Per cent.
	Tons.		Tons.		Tons.		Tons.	
I.—Titaghur Paper Mills Company.								
1924-25	0·63	...	5,686·42	36·55	3,146·65	26·70	5,716·30	36·75
1925-26	10·23	0·06	3,841·61	23·91	4,625·75	28·78	7,592·41	47·25
1926-27	47·62	0·27	5,016·94	29·31	4,326·81	25·28	7 726·63	45·14
1927-28	112·40	0·63	4,636·19	26·23	4,154·54	23·51	8,771·87	49·63
1928-29	331·58	1·75	4,346·54	22·90	3,913·61	20·62	10,388·27	54·73
1929-30	165·28	0·88	5,279·33	28·17	3,848·81	20·54	9,447·58	50·41
1930-31	1,841·57	9·56	5,486·92	28·49	3,409·24	17·70	8,522·27	44·25
II.—Bengal Paper Mill Company.								
1924-25	..	..	2,626	41·36	1,998	31·47	1,725	27·17
1925-26	..	..	2,230	35·86	1,747	27·47	2,332	36·67
1926-27	..	..	3,195	38·53	1,775	21·41	3,321	40·06
1927-28	..	..	3,007	34·45	1,859	21·29	3,864	44·26
1928-29	1	0·01	2,740	29·87	2,238	24·40	4,194	45·72
1929-30	8	0·09	3,019	33·20	1,393	15·32	4,672	51·39
1930-31	16	0·17	2,918	31·65	1,483	16·12	4,801	52·06

APPENDIX I—*contd.*

	Bamboo	Per cent.	Grass.	Per cent.	Other Materials.	Per cent.	Wood Pulp	Per cent.
	Tons.		Tons.		Tons.		Tons.	
III.—India Paper Pulp Company.								
1924-25	1,943	76·35	..	..	67	2·63	535	21·02
1925-26	1,738	73·09	..	..	4	0·17	636	26·74
1926-27	1,443	55·80	..	..	145	5·61	998	38·59
1927-28	1,453	33·34	..	..	297	6·81	2,608	59·85
1928-29	1,580	26·32	..	..	443	7·52	3,869	65·66
1929-30	1,653	27·29	..	..	634	10·47	3,769	62.24
1930-31	1,876	30·32	..	..	411	6·64	3,901	63·04
IV.—Upper India Couper Paper Mills Company.								
1924-25	..	..	407	23·92	1,294·47	76·08	..	..
1925-26	...	..	396	15·62	2,139·2	84·38	...	..
1926-27	..	..	572	21·66	2,051·7	77.73	16	0·61
1927-28	..	..	697	26·20	1,813·52	68·16	150	5·64
1928-29	..	..	650	22·66	2,060·19	71·80	159	5·54
1929-30	..	..	483	16·89	2,122	74·22	254	8·89
1930-31	..	..	405	14·97	1,995·8	73·76	305	11·27

APPENDIX II.

June 1930. Pages 4—8.
No. 1.

THE TIMBER GROWERS' QUARTERLY REVIEW.

The Official Organ of the New Zealand Timber Growers' Association, Incorporated.

SOFTWOOD SUPPLIES OF THE BRITISH EMPIRE: BY FRAZER STORY (FORESTRY COMMISSION, LONDON).

(Extract from Empire Forestry Journal, Vol. 8, No. 1, 1929.)

(*Editor's Note.*—Mr. Story certainly leads us up to a startling conclusion to his survey when he informs us that in forty years from now very little will be left of the world's existing accessible virgin forests. His opinion, however, is backed by figures which are the result of the most careful possible investigations; and his reputation is such that the soundness of all his delivered opinions on this subject is quite indisputable.)

As the whole Empire, with the single exception of Canada, imports large quantities of softwoods, and as the world's supply of that class of timber is limited, it behoves us to examine the position. It is possible to do this afresh with the help of the statistics which have just been collected by the Forest Authorities of the Empire for presentation to the Empire Forestry Conference.

Consumption of Softwoods.

The Empire uses each year (in terms of round timber) over 1,900 million cubic feet of softwoods. Of this, some 935 million (49 per cent.) are utilised in Great Britain; 735 million (38 per cent.) in Canada; 90 million (49 per cent.) in Australia; 55 million (3 per cent.) in New Zealand; 3½ million (2 per cent.) in South Africa; and 63 million (3 per cent.) in other parts of the Empire. These figures represent in each case the amount actually utilised at home—they do not include the quantities of timber exported nor any destroyed by fire, etc.

Taking the various units of the Empire separately, the softwood requirements are briefly discussed below:—

Great Britain's Consumption of Softwoods.

Practically the whole of the softwood supply has to be imported—only 3 per cent. being produced at home. Apart from wood pulp, we import in an average year 9½ million loads, valued at over £40,000,000. British possessions overseas contribute about 500,000 loads, or only 5 per cent. of the whole. The principal sources drawn upon are Finland and Sweden, which, taken together, send us about 3,500,000 loads (37 per cent.); Russia, Latvia and Poland, 2,500,000 loads (26 per cent.); France 1,400,000 loads (15 per cent.); and other foreign countries, 1,600,000 loads (17 per cent.).

Additional to the above is wood pulp, which during the last two years, was imported to the extent of 1¼ million tons, valued at just under £10,000,000. About 90 per cent. of this comes from Sweden, Norway and Finland, and only 8 per cent. from British Dominions.

Canada's Consumption of Softwoods.

In addition to its home utilisation of 735 million cubic feet, there is an exportation of 1,160 million cubic feet, of which fully 86 per cent. goes to the United States; the remainder is sent chiefly to Europe, Australia, and South Africa. Whereas exports to Great Britain are barely maintained, the quantity sent to the United States is rapidly increasing.

A particularly striking development in Canada is the remarkable expansion of the pulp and paper industry. That this has gone ahead by leaps and bounds is shown by the following figures:—In 1913 the quantity of newsprint produced was 35,000 tons; but in 1923 it had increased to 1,266,000 tons, and in 1927, partly as the result of overproduction, it amounted to fully two million tons.

Softwood Consumption in other Dominions.

Apart from Great Britain and Canada, the quantity of softwoods consumed in the Empire is about 239 millions cubic feet. Australia, New Zealand and South Africa take most of this.

Australia.—Australia obtains its softwoods mainly from the United States, but it imports also to some extent from Canada, Scandinavia, and New Zealand. Sweden and Norway contribute jointly about 20 per cent.

New Zealand.—Approximately 90 per cent. of the softwoods imported into New Zealand comes from the United States and Canada—in nearly equal proportions.

South Africa.—It is somewhat surprising to find that South Africa imports 75 per cent. of its softwoods from Baltic ports. Most of the remainder is obtained from the United States, and comparatively little from Canada.

Other Empire countries.—Although softwoods are required in varying quantities in other parts of the Empire, the demand in the aggregate only amounts to some 63 million cubic feet per annum, or 3 per cent. of the Empire's softwood consumption, and therefore their requirements do not seriously affect the general question under consideration.

Softwood Resources within the Empire.

The conifer forests of Canada occupy such pre-eminence among Empire softwood resources that the discussion may also be limited to the position in that country.

Canadian Resources.—According to a report submitted to the recent Empire Forestry Conference by the Canadian Forest Authority, conifers predominate on about 737 million acres. Of this area, however, only about 179 million acres are classified as accessible and merchantable, and only about 128 million acres carry mature, virgin timber. Taking the average of the last five years for which statistics are available (1922 to 1926), the annual cut of conifers has been 1,860 million cubic feet of standing timber, and a further volume of 1,380 million cubic feet is recorded as lost annually owing to forest fires, insects and fungus pests. The total annual depletion is, therefore, 3,240 million cubic feet. As the total stand of softwood timber in Canada is estimated to amount to 177,000 million cubic feet, of which (with existing means of transportation and at present prices) 100,000 million cubic feet are accessible and merchantable, it will be seen what serious inroads are being made into forest capital. It has also to be borne in mind that nearly three-quarters of Canada's original stock of merchantable timber has already disappeared.

The gravity of the position is, if anything, intensified by a personal inspection of the forest areas themselves. The magnificent white pine forests of Eastern Canada have gone, and the lumber industry is now concentrating on the great conifer forests of the West. Over 70 per cent. of the timber supplies of the Dominion are now to be found in British Columbia. The Eastern Provinces have been stripped of all but small-sized timber, and the remarkable expansion of pulp-milling and paper manufacture threatens the continuance of the little that remains.

The treatment of the old stands, the neglect or abuse of the young growth, in spite of the efforts of the Forest Service, the absence of care in the extraction of the product, and the large percentage of waste in utilisation, comes as a shock to the European forester. Speaking generally, no steps are taken to re-stock cleared areas with profitable species. During logging operations, all the valuable conifers are removed, fire nearly always breaks out in the debris, and burns, with the litter, any remaining conifers. Most usually fire sweeps through the young growth twice or thrice subsequently. The result is that conifer forests are succeeded, not by new conifer forests, but by a more or less worthless growth of such species as birch and poplar. These trees must be regarded as weeds, for they have little or no value in themselves, and they take possession of denuded areas which ought to be occupied once more by conifers. It may be argued that eventually the pines, spruces and firs will reassert themselves; but it is obvious that in most cases the process will be an extremely slow one for, in Canada, the birches and poplars grow into large-sized trees, which will only very gradually give place to conifers.

What makes matters worse, in the more accessible logged-over areas, is the temptation—apparently irrestible—to remove any naturally-regenerated conifers which spring up among the broad-leaved trees as soon as they attain useful dimensions. Young poles of this description, being locally the only marketable produce, are quickly seized and disposed of, either on farms or in the pulp mills.

If fire could be kept out of the forests and some attention given to the preservation of mother-trees, there would be no fear of the maintenance of conifer crops, but only here and there does one see any sign of this being done. As Mr. R. D. Craig, Canadian Forest Resources Officer, has remarked, there seems to be no limit to the exploitation except the capacity of the market for absorbing the material produced.

The lack of regard for future crops seems to be principally due to thoughtlessness, but to some extent it is also attributable to impatience, for the nursing of a young forest up to the producing stages is a slow and tedious business. All things considered, it appears probable that the virgin conifer stands will rapidly disappear and that much of the succeeding growth will have little value.

Canada, no doubt, will always have sufficient quantity of softwoods to satisfy its own very considerable needs, and have something over—although before long not nearly enough—to meet the growing demands of the United States. As an Empire supply it is a failing source.

Softwood Resources of other Empire Countries.

Of other British Dominions, New Zealand is not altogether unfavourably situated, as its existing conifer stand is extensive and the country has definitely embarked on a vigorous afforestation programme. In course of time it may become entirely self-supporting. Australia, as far as my information goes, is less happily placed, and its present softwood importations to the extent of £4,000,000 a year, may have to be increased as the population grows. South Africa shows promise of extending its conifer plantations sufficiently to meet the country's requirements, but it will take many years to achieve this result.

Empire countries in the tropics do not contain very large areas of conifers; but some of the species are of considerable value—for example, the pencil cedar of Kenya Colony. In British India deodar and pines are of importance among softwoods, and the total area under coniferous species amounts to approximately 3½ million acres.

A time may come when the lighter, more easily-worked hardwoods of tropical countries may to some extent be utilised in place of conifers.

Great Britain, very poorly supplied with wood-lands, has at last taken up forestry with energy and in a business-like fashion. The Forestry Commission have faced the task of afforestation, in spite of the lengthy period which must elapse before newly-planted areas produce returns. The State is at present planting about 23,000 acres each year, and the rate may be increased. By means of grants, tree-planting by private individuals and local authorities is also encouraged. Much leeway has to be made up, because the total woodland area is very small, and bears little relation to the country's timber requirements.

Softwood Resources outside the British Empire.

This part of the subject is probably somewhat controversial, because in it must be discussed the resources of conifer regions, about some of which we know comparatively little. Everyone is aware that conifer forests are confined to the temperate regions, and are indeed almost limited to the broad belt which stretches across North America, North Europe, and on to the east of Asiatic Russia. It is true that there are considerable areas of conifers in New Zealand, parts of Australia, the Himalayas, and Brazil, but about 95 per cent. of the world's conifers occur in the north temperate zone, and principally in North America, Northern Europe, and Siberia. A review of the British Empire position in regard to softwood supplies necessitates reference to these regions.

American Resources.

Forest depletion in the United States has followed fairly similar lines to that in Canada. New England was the first district to be attacked and the lumber industry was later gradually developed in Pennsylvania and New York, whence operations, on a greatly extended scale, spread to the pine and spruce forests of the Lake States. Having made practically a clean sweep of the original forest area there, the great mills moved on to the Gulf States, which in turn are now so seriously threatened that there is further migration of the lumber industry to the West, where, in the States bordering the Pacific Coast, is found the one remaining extensive conifer forest region in the United States.

Instead of the forests being fairly evenly distributed in East and West, as was once the case, about three-quarters of the conifer stand is now to be found along the Pacific Coast. With the lumber industry concentrating upon that region, there is little prospect of its being able indefinitely to meet the demands made upon it.

The United States practically controls the world situation as regards timber consumption, because it uses nearly half the sawmill timber and more than half the wood-pulp of the world. Statistics show that the annual cut of softwoods is four times as great as the annual growth. The total annual drain upon the conifer forests is enormous, and is estimated to exceed 12,000 million cubic feet of standing timber. Although there are signs of a falling off in the rate of utilisation owing to economic causes, it is practically certain that consumption will continue on a scale which is far beyond the rate of growth. Consequently, the United States will draw more and more on Canada for its supplies, and will presently enter into keen competition with other countries for the remaining softwood supplies of the world.

European Resources.

The forests of Sweden and Finland, from which the British Empire obtains such a large percentage of its supplies, are fortunately managed with skill, and, for the most part, are carefully conserved.

Probably, neither of these countries may be able greatly to augment its exports in years to come; increase in population may swallow up what additional timber the forests may yield; but at least one feels pretty sure of their ability to maintain the output. The State Forestry Departments of these countries pursue the policy of restricting the amount felled to an equivalent of the annual increment.

Russian Resources.

An examination of the extremely important question of supplies from Russia brings one to the conclusion that the country's accessible conifer forests do not exceed 80 million acres. Further, it appears that the net increment on the merchantable area is approximately 1,600 million cubic feet, whereas the annual consumption amounts to about 3,400 million cubic feet. If this is anywhere near the mark, it naturally follows that the permanence of the Russian supply is by no means secure. Home consumption, as well as exportation, is reducing the supplies. Few realise that there are as many people in Russia as in the United States, and, of course, each inhabitant uses a large quantity of timber. Russia has only four acres of forest per head of population, whereas Sweden has ten acres *per capita*, and Canada about sixty-eight. Precise figures are lacking, but it is obvious that with about 130 million inhabitants Russia's softwood consumption must be enormous.

(*Editor's Note.*—At the present time, Russia, without thought for the future, is feverishly realising on her accessible softwood stands and flooding the European market with her timber, in order to raise capital for industrial development.)

Siberian Resources.

The position in Siberia—the only other conifer region of importance—is obscure. The country has not been fully explored, and, therefore, the acreage and contents of its very extensive forests cannot be computed. Attempts to estimate resources have been made at various times, and that of Boris Baievski (1924) may be taken as possibly approximately true. He gives the total conifer area as 765 million acres. I need not describe here the character of the country, but it is evident that large deductions must be made to allow of swamp and scrub and poorly developed forest. Not many of the rivers are suitable for the floating of logs, and a further great deterrent to exploitation is the want of forest labour, which, under the circumstances, would be difficult to obtain from outside sources. In a paper prepared for the Empire Forestry Conference last year, I suggested that the effective area might be taken as 10 million acres of readily exploitable conifers, and if a stand of 1,000 cubic feet per acre be assumed, the total volume available is shown to be just equal to the accessible softwood resources of Canada. The estimate probably errs on the side of liberality—in other words, it is unlikely that the contents of the accessible conifer forests of Siberia amount to 100,000 cubic feet.

Resources of other Conifer Regions.

Accessible conifer forests in parts of the world not mentioned above here have an estimated total area of approximately 110 million acres. About 75 per cent. of these resources are found in Brazil, Mexico, China, and Japan, which are themselves large importers of softwoods. These resources, although important locally, are therefore of no great account when regarded from a world supply point of view.

Softwood Resources and Consumption compared.

If we compare the figures relative to the world's softwood consumption with the estimated contents of the world's conifer areas, the outlook is somewhat alarming. I have ventured to give some figures in the form of a table in order to summarise the available information and to present a picture of the position. The figures are not to be regarded as accurate, but they may help the reader to visualise the state of affairs:—

Accessible Conifer Forests (Estimated).	Approximate Resources. Million c.ft.	*Approximate Consumption—Annual Drain on Forests (amt. cut and destroyed). Million c.ft.
United States of America	390,000	12,000
Canada	100,000	3,200
Europe	285,000	8,000
Siberia	100,000	1,000
Other Regions	110,000	1,500
TOTAL	985,000	25,700

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* Expressed in terms of standing timber.

The estimated stand being about 985,000 million cubic feet and the annual drain about 25,700 million cubic feet, it follows that, AT THE PRESENT RATE OF CONSUMPTION, VERY LITTLE WILL REMAIN OF THE ACCESSIBLE VIRGIN FORESTS OF THE WORLD FORTY YEARS HENCE.

The calculation does not take into account increment on second-growth conifers in the intervening years, but the amount of this cannot in any case affect results appreciably, and new forests from artificial formation will, for the most part, be immature at the end of the period mentioned.

Assuming that second-growth and reafforestation from now onwards make satisfactory progress, there is still the danger of an awkward gap between the virtual exhaustion of primeval forests and the time of harvesting the young crops.

It has been argued in certain quarters that softwood prices will rise, and that the rate of utilisation will consequently be checked. Unfortunately, such an easy solution of the problem is, I fear, untenable. World output is largely controlled by the big mills of North America, and in that country production on the largest scale is the settled policy of the lumbermen. The whole layout of the mills, together with the logging operations connected with them, is conceived on the plan of huge output—their very existence depends upon it. As a result, world markets are kept constantly provided with as much timber as they can take, and prices do not, and will not, show any marked increase. I firmly believe it will not be until the huge American sawmills are put out of action owing to the comparative exhaustion of the virgin conifer forests, that softwood production will be materially reduced. I suggest that little or no reliance be put upon a rise in price as a controlling factor in preventing the disappearance of the accessible virgin forests.

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APPENDIX III.

Note by the Officer-in-Charge, Paper Pulp Section, Forest Research Institute, Dehra Dun, on the subject of the comparative strengths of bamboo and grass papers.

As desired by the Tariff Board, during the course of examination in July last, I have carried out tests on papers made purely from (*a*) *sabai* grass (*Ischœmum angustifolium*) and (*b*) *Dendrocalamus strictus* bamboo. As is well known, the strength of paper depends largely on the manner in which the pulp from which it is produced is " beaten ", that is, on the length and fibrillation of fibres and on the " Wetness " of the beaten pulp. The time required for " beating " a pulp is, therefore, determined by the degree of " wetness " and fibrillation required for the production of a particular grade of paper. In carrying out comparative tests on *sabai* grass and bamboo paper, therefore, " beating " was so manipulated that while the average length of ultimate fibres was kept unimpaired, as far as possible, the requisite degree of " wetness " was produced in the pulp to produce a strong sheet of as nearly as possible the same substance in the case of both grass and bamboo. This naturally required different periods of beating for the two pulps. The results of strength tests on typical sheets of this grass and bamboo paper are summarised in the table below:—

Temperature 83° F. Relative humidity 76.

	Bamboo.	Grass.
1. Breaking length in meters . . .	3,636	3,561
2. Stretch per cent.	5·3	6·4
3. Burst Factor	24·2	23·7
4. Tear Factor	181	169
5. Double Folds	192	210
6. Freeness No. (Canadian tester) . .	116	70
7. Average length of fibres in paper in m.m.	2·30	1·9

Beating time for bamboo pulp was about 25 per cent. more than for grass pulp and yet, as is seen from the figures for freeness number in the table above, the bamboo pulp was not nearly so " wet " as grass pulp. Nevertheless, the paper produced from the bamboo pulp was, actually, stronger than that produced from the grass pulp. If the " beating " of bamboo pulp had been carried on for longer so that its " wetness " equalled that of the grass pulp, and in such a way that the ultimate fibres were not shortened, the paper produced from it would have been stronger still. The experiments do not, therefore, lend support to the view generally held that *sabai* grass yields a stronger paper than bamboo. The experiments do, however, show that bamboo fibre is comparatively more " free " than grass fibre and consequently requires longer time for beating in order to produce a desired degree of " wetness ". Further experiments would have to be carried out to determine exactly the extra time required for beating bamboo pulp in order to produce from it paper, equal in strength to that produced from *sabai* grass. It would also be of value and interest to Paper Mills in this country, if experiments were carried out here to ascertain the conditions under which paper with a maximum strength can be produced from *sabai* grass and bamboo separately or from a mixture of the two fibres. These experiments would, however, require a long time to be carried out. Meanwhile a report on the tests carried out so far may kindly be forwarded to the Tariff Board.

Samples of grass and bamboo paper are attached herewith.

APPENDIX IV.

Statement showing the effect of replacing the protective duty by the Revenue duty on the finances of the Companies based on their latest figures.

1. *Titaghur Paper Mills Company*—

	Rs.
Average price realised, 1930-31, As. 3-3·43 per lb. .	460 a ton.
Less duty at Rs. 140 a ton	140
	320
Add duty at 20 per cent.	64
Price realisable at Revenue duty	384 a ton
Total output 1930-31	19,260 tons.

		Rs.
Total receipts at Rs. 384 a ton		73,95,840
Deduct Works expenditure, 1930-31 . . .		69,35,052
	Surplus	4,60,788

	Rs.	Rs.	
Block as at March 31st, 1930	44,20,701		
Depreciation at 6¼ per cent. . .		2,76,294	
Loan outstanding on 31st March 1931 .	17,31,151		
Interest at 6½ per cent.		1,12,525	
Deduct for depreciation and interest .			3,88,819
		Balance	71,969

Charges for Managing Agency and Head Office Expenses in 1930-31 amounted to Rs. 2,08,763. The balance is not sufficient to meet this charge. The Company have mortgage debentures amounting to Rs. 30 lakhs on which interest works out at Rs. 2,30,000. This will not be met nor will there be anything to distribute as dividend.

2. *The Bengal Paper Mill Company*—

	Rs.
Average price realised, 1930, As. 3-1·84 per lb. .	441 a ton.
Less duty at Rs. 140 a ton	140
	301
Add duty at 20 per cent.	60
Price realisable at Revenue duty . . .	361 a ton.
Total output, 1930	9,218 tons.

	Rs.
Total receipts at Rs. 361 a ton	33,27,698
Deduct Works expenditure, 1930 . . .	32,34,123
Surplus .	93,575

	Rs.	
Block as at December 31st, 1929 . . .	13,83,169	
Deduct depreciation at 6¼ per cent. . . .		86,448
Balance .		7,127

In 1930 this Company produced 1,550 tons of wrapping paper which does not have the benefit of the protective duty. If we assume that on these 1,550 tons the Company would receive the average price without reduction, their total receipts would be increased by Rs. 1,24,000, giving a balance of Rs. 1,31,127 in all. This would barely suffice to cover their Head Office Expenses which are Rs. 1,38,607 and leave nothing for the Managing Agents' Commission, which in 1930 amounted to Rs. 83,961; the Company would not be able to find the Rs. 36,000 required to pay interest on their mortgage Debenture loan; nor would they be able to pay any dividend on their share capital.

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3. *India Paper Pulp Company*—

	Rs.
Average price realised, 1930-31, As. 3-4·40 per lb.	471 a ton.
Less duty at Rs. 140 a ton	140
	331
Add duty at 20 per cent.	66
Price realisable at revenue duty	397 a ton.
Total output, 1930-31	6,188 tons

	Rs.
Total receipts at Rs. 397 a ton	24,56,636
Deduct works expenditure, 1930-31	20,46,022
Surplus .	4,10,614

	Rs.	Rs.
Block as at March 31st, 1930 . . .	29,24,918	
Depreciation at 6¼ per cent. . . .		1,82,807
Advance outstanding on 31st March 1931 .	20,28,379	
Interest at 6½ per cent.		1,31,845

	Rs.
Deduct for depreciation and interest . .	3,14,652
Balance .	95,962
Managing Agency and Head Office charges .	73,167
Balance .	22,795

The balance is not sufficient to pay a dividend of even 1 per cent. on the capital of Rs. 30 lakhs.

4. *Upper India Couper Paper Mills Company.*—The Company have not given the average price realised for their paper; but their oral evidence indicates that an approximate price of 3 annas a lb. in 1930 will not be far out.

	Rs.
This is equivalent to	420 a ton.
Less duty at Rs. 140 a ton	140
	280
Add duty at 20 per cent.	56
Price realisable at Revenue duty . . .	336 a ton.
Total output, 1930	2,600 tons.

	Rs.
Total receipts at Rs. 336 a ton	8,73,600
Deduct Works expenditure, 1930 . . .	10,86,701
Deficit .	2,13,101

This Company have about Rs. 11 lakhs invested, from which the interest in 1930 amounted to Rs. 74,122: even taking this receipt into account they are down by Rs. 1·39 lakh, before finding the Rs. 17,118 which they need for depreciation at 6¼ per cent. on their block of Rs. 2,73,885, or the Rs. 36,750 which they spend on Head Office and Directors' fees or of course before declaring a dividend.

5. *Deccan Paper Mills Company*—

	Rs.
Average price realised, 1929-30, As. 2-9 a lb. .	385 a ton.
Less duty at Rs. 140 a ton	140
	245
Add duty at 20 per cent.	49
Price realisable at Revenue duty . . .	294 a ton.
Total output, 1929-30	2,124 tons.

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	Rs.
Total receipts at Rs. 294 a ton	6,24,456
Deduct Works expenditure, 1929-30 . .	6,94,705
Deficit .	70,249

13 per cent. however of this Company's output consists of wrappings which are not protected by the higher duty. If we allow the full average realised price on this proportion of their output—276 tons, their total receipts would be increased by Rs. 25,116; but would still be short of the amount of works expenditure by Rs. 45,133. For depreciation at 6¼ per cent. on their block of Rs. 8,87,440 they need Rs. 55,465; and for interest at 6½ per cent. on a loan of Rs. 2,22,235 they need Rs. 14,445. They would thus have to make up at least Rs. 1 lakh before they could think of paying any dividend.

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